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## Investigating the effects of replacing the project manager during project execution

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MEng - Master of Engineering Management 2015

## Executive Summary

**Title:** Investigating the effects of replacing the project manager during project execution  
R.J. Dubber

This dissertation aims to investigate the effects of replacing the project manager during project execution. The topic for the minor dissertation has been identified in order to investigate and clarify the frequency of project manager turnover and the effects it has on a project in terms of project management key areas during the execution phase of a project.

The value of the topic is to identify the effects of the project management key areas and the associated risk with project success. The term “replacing the project manager” or “RPM” should be easily recognised by organisations as the frequency of replacement is a common occurrence. Yet, there is very little documentation available discussing the issue of RPM – the frequency of replacement, the circumstances under which the project manager is replaced and the net effect it has on a project.

A literature review is presented to identify critical aspects of the project manager’s role through the intersection of three subjects – project management purpose and scope, organisational structures and the project manager. The three subjects and the researched effects of replacing the project manager during project execution form the first part of the research process.

The second part of the research process is used to substantiate the findings in the literature review by means of a case study and web-based survey. The data are captured, tabulated and graphically presented to conclude that RPM is in fact a critical topic that must be carefully managed.

## Acknowledgements

I would like to express my gratitude to my friends and family who have all had an influence on my life and led me to where I am today. The love, support and patience I have received during my tertiary education will forever be appreciated.

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## List of Acronyms

E&I	Electrical and instrumentation
EPC	Engineering, procurement and construction
EPCM	Engineering, procurement and construction management
FIDIC	International Federation of Consulting Engineers
ICMI	International Cyanide Management Institute
PM	Project manager
PMO	Project management office
RPM	Replacing the project manager
SHEQ	Safety, health, environment and quality
SMPP	Structural, mechanical, platework and piping



## Chapter One: Introduction

### 1.1. Introduction to Replacing the Project Manager (RPM)

It is a setback that many projects face, and senior management fear, that a well-run project heading for success can take a turn for the worse when the project manager is replaced as a result of resignation or transfer. The replacement of the lead and foundation of the project can result in a loss of information, as well as a ripple effect of conflict, confusion, misunderstanding and poor team spirit within the project team.

Alternatively, the project manager's capability to successfully execute a project may be weak, or the project focus poor as a result of conflict between the project manager and project stakeholders. In an attempt to salvage the project, the project manager may be replaced with a more experienced project manager who can execute the project in a more effective and efficient manner, and foster a positive relationship with the project team and client.

Different management styles are practised across the various engineering disciplines. Project management, however, is a growing profession in all facets of engineering (and other occupations) and is based on similar management guidelines. The correct implementation of the principles of project management is, however, more difficult in practice. This, together with different individual personalities, interests and capabilities almost guarantees the assertion that replacing the project manager is not a simple procedure. Replacing a project manager successfully is not an easy task and can cause major disruption to the project from both an employer and employee perspective.

Investigating the effects of replacing the project manager during project execution will identify the frequency of replacing the project manager, the circumstances in which the project manager is replaced, and the effects on a project in terms of project management principles. Furthermore, guidelines to facilitate the handover to limit the impact on a project are proposed and investigated.

### 1.2. Problem Statement

Project management is a growing profession in all industries. Text books and literature have been written on the profession and the guidelines to carry out project management, tailored to suit the industry in which it is practised, are well documented. The literature focuses particularly on project management and managers; their roles and responsibilities, and how

critical they are during a project process. Information that is not often documented or portrayed as an integral part of a project life cycle, however, is the effect of replacing the project manager during project execution.

Replacing the project manager (RPM) has a net effect on a project – positive, negative or neutral. The influence of RPM is not well understood, neither documented nor assessed in great detail. This information is critical to the project management process and ensuring project success in cases where RPM is experienced.

### 1.3. Research Process

The minor dissertation topic, “Investigating the effects of replacing the project manager during project execution,” is theory based and validated in two parts. The first is journal and research material in the form of a literature review. The literature review focuses on three aspects (subjects) of project management:

- Project management purpose and scope,
- Organisational structures, and
- The project manager.

The three identified areas of project management provide a strong argument for the project manager’s role, decision-making and critical involvement in a project. Identifying the criticality of the project manager and establishing a link between the investigated effects of RPM presents a defined scope for the literature review.

The second part is a research approach using a case study as well as a results-driven component, captured via a web-based survey. A questionnaire developed to gather data and analyse results based on factual information to supplement the literature will provide significant findings to draw a conclusion on the topic.

The overall research process is indicated in Figure 1.

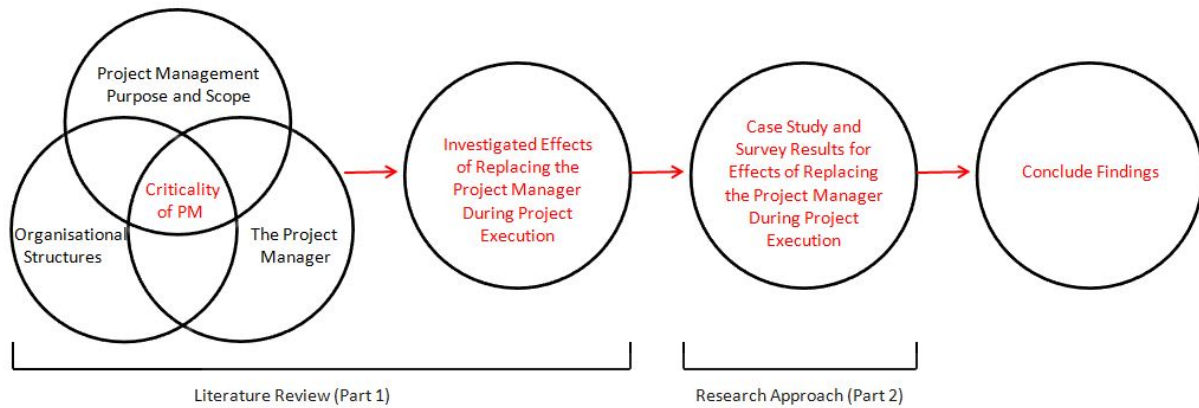


Figure 1: Research process

#### 1.4. Research Objectives

By following the research process, the following objectives will be achieved:

- Review of literature on project management, organisational structures and the project manager, and the intersection of these three subjects to identify the criticality of the project manager during the execution phase of a project,
- Review of literature on RPM and the effect it has on a project from a project management perspective,
- Review of research methodologies and identification of the most suitable method(s) for achieving the desired outcomes relative to the defined problem statement,
- Implementation of the identified research methodologies, and presentation of a case study and survey to supplement the literature,
- Data collection, evaluation and visual presentation of results, and
- Presentation of researched results to conclude the requirements of the problem statement.

## 1.5. Overview of Dissertation

The chapters presented in the dissertation will sequentially take the form indicated in Figure 2:

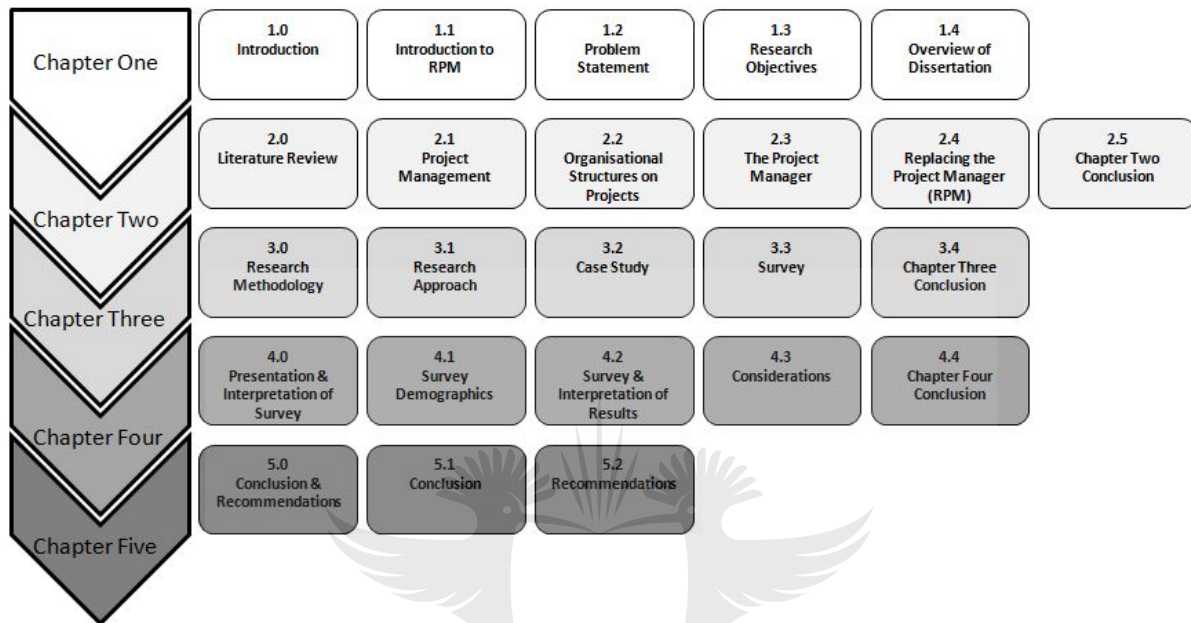


Figure 2: Overview of dissertation

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## Chapter Two: Literature Review

### 2.1. Project Management

The background of project management is presented for the understanding of a project and how project management facilitates the success of project processes.

#### 2.1.1. Project Management Defined

A project is a temporary endeavour undertaken to produce a unique product, service or result. It always has a defined beginning and end, and therefore a defined scope and allocation of resources [1]. Projects are also the means by which organisations achieve their business objectives by generating a profit [2]. Project management is therefore the application of knowledge, skills and techniques used to execute a project effectively and efficiently [1].

Projects go through similar stages on the path from origin to completion and these stages are referred to as the project life cycle [3]. The Project Management Body of Knowledge (PMBOK®) defines a project life cycle as a series of phases that a project passes through from its initiation to its closure. The phases are generally sequential, and their names and numbers are determined by the management and control needs of the organisation or organisations [4]. The project life cycle is generally a four-stage model (literature indicates that alternative models could have more project stages) as follows [5]:

1. Conceptualisation (initiation).
2. Planning.
3. Execution.
4. Termination (closure).



The literature review, in conjunction with the dissertation title, “Investigating the effects of replacing the project manager during project execution,” will primarily focus on the execution phase of a project as indicated in Figure 3.

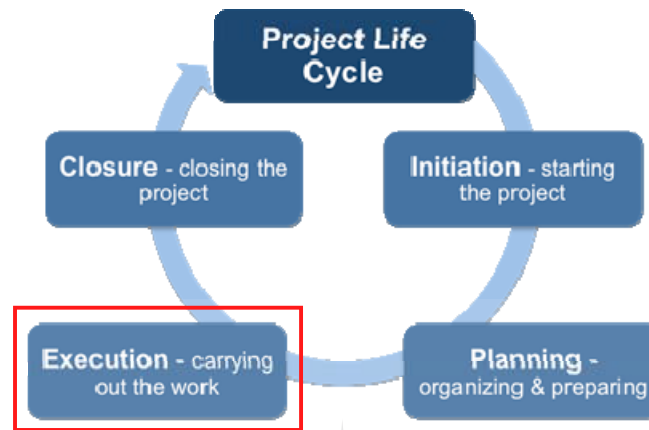


Figure 3: The project life cycle [6]

The core aspects of project management fall under the umbrella of the 10 knowledge areas, uniquely identified and applicable to an individual project, described in the PMBOK® as [4]:

- Project Integration Management,
- Project Scope Management,
- Project Time Management,
- Project Cost Management,
- Project Quality Management,
- Project Human Resource Management,
- Project Communications Management,
- Project Risk Management,
- Project Procurement Management, and
- Project Stakeholder Management.

Critical to project management and the execution of a project is the understanding and managing of the project management triangle (also called the triple constraint or iron triangle), illustrated in Figure 4. The triangle illustrates the interaction of scope, time and cost on project trade-offs – one constraint cannot be changed without impacting another. The triple constraint is a critical project management concept that originates from the basis for undertaking a project and provides direction for framing the project [7].



Figure 4: The project management triangle [7]

The current literature in the project management domain suggests that there exists a lack of appropriate (and consistent) scholarship on the triple constraint and its dynamics [8]. The triple constraint dynamics are paramount to effective project management and without the effective management of the triple constraint, projects run the risk of becoming separated from purpose [8]. The inherent trade-off dynamics of the triple constraint can be described by the following three key relationships [8] [9] [10]:

- Relationship 1,  $\text{Scope} \uparrow \propto \text{Time} \uparrow \text{Cost} \uparrow$ , which signifies that scope targets can be delivered at the expense of time and/or cost targets,
- Relationship 2,  $\text{Time} \downarrow \propto \text{Scope} \downarrow \text{Cost} \uparrow$ , which signifies that time targets can be delivered at the expense of scope and/or cost targets, and
- Relationship 3,  $\text{Cost} \downarrow \propto \text{Scope} \downarrow \text{Time} \uparrow$ , which signifies that cost targets can be delivered at the expense of scope and/or time targets.

Van Wyngaard *et al* [8] developed the TRIJECT model (an acronym created from the titles “TRIPLE constraint” and “PROJECT management”) which assists project managers in aligning the triple constraint with the project requirements or higher purpose. An example of the TRIJECT model is indicated in Figure 5 and aligns the primary triple constraint variable (scope) with the project higher purpose through the exploitation of the two more flexible constraints (cost and time). The graphic outline of the TRIJECT model resembles a capital letter “Q” which signifies the central presence of quality [8].

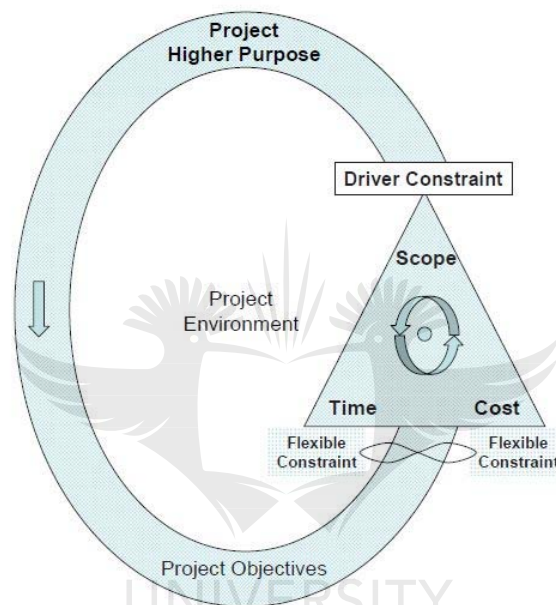


Figure 5: TRIJECT model [8]

The project management triangle, which constitutes the heart of the TRIJECT model, can pivot about its central axis to accommodate the project higher purpose as change is introduced into the system [8]. The cyclic nature of change during a project allows the project manager to realign the driving constraint with the project higher purpose as the project moves forward.

### 2.1.2. Significance (Value) of Project Management

The history of project management dates back to thousands of years BC. In the last century, the influence of world war and the need for rapid growth and development of technologies resulted in the military developing the project management techniques and concepts implemented today.

The use of project management in organisations exploded in the mid-1990s, and the rapid increase in implementation is primarily due to three driving factors, namely [3]:

1. The expansion of human knowledge.
2. The growing demand for complex, sophisticated, customised goods and services.
3. The ever increasing competitive global markets.

The growth in the field and literature of project management is attributed to the need for sophisticated systems to control outcomes and processes where these three factors have resulted in complex goods and services, and complex processes to produce them [3]. The history of Project Management Institute growth is indicated in Figure 6.

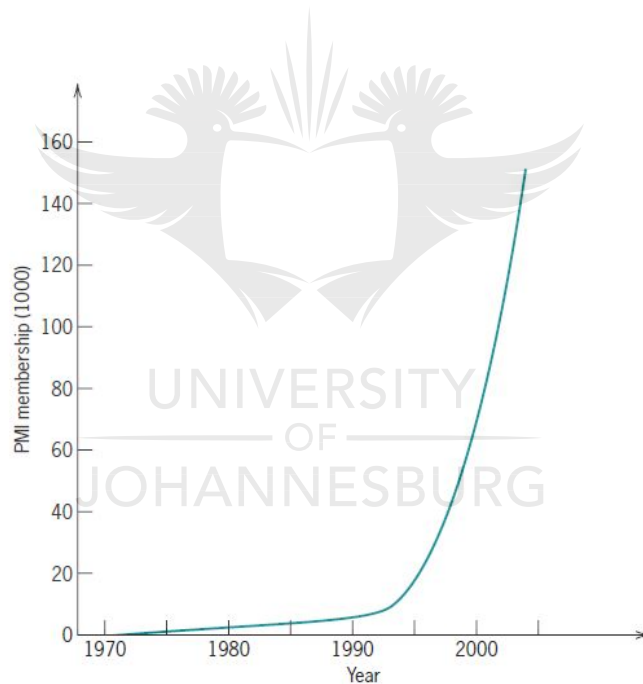


Figure 6: Project Management Institute growth history [3]

Organisations implementing project management strategies are realising the increase in business value as it matures. The recognised advantages of project management methods and strategies are, but not limited to [11]:

- Optimising resources,
- Project planning and due diligence,
- Risk assessment and control,
- Cost control,
- Quantitative and qualitative project measurement,
- Increased efficiencies,
- Improved client satisfaction,
- Greater competitive advantage, and
- Improved project success rates.

The current economic conditions and global competitive market calls for improvement in all of the identified areas for organisational survival. A report published by the Economist Intelligence Unit, based on a survey of 213 senior executives and project managers worldwide, provides evidence to validate the significance of project management practices in organisations. The report concluded that 90% of global senior executives ranked project management methods as either critical or somewhat important to their ability to deliver successful projects and remain competitive [12]. Furthermore, a survey carried out by McKinsey and Company yielded 60% of senior executives stating that building a strong project management discipline is a top-three priority for their companies [13].

## 2.2. Organisational Structures on Projects

The organisational structure implemented for a project and the characteristics of each can influence how a project is conducted [4]. The relevance and association of the implemented organisational structure and the effects of replacing a project manager is significant. This is a result of the project manager's assigned roles and responsibilities, governed by the project's organisational structure, which may be jeopardised upon departure of the project manager.

### 2.2.1. Organisational Structure Types

Organisation structures are a function of multiple variables including organisational size, type, culture, project deliverables and overall objectives. Functional, projectised and matrix are the three main "pure" forms of organisational structures and are briefly described in the following text [3].

Functional structures have the form of multiple functional units (departments) carrying out specific functions. Each functional unit, such as process, mechanical, civil and electrical departments, reports to a functional manager and project work is carried out independently of other functional units. The project coordination and assigned resources are carried out by the functional managers. The form of a functional organisational structure is represented in Figure 7. The grey boxes represent staff engaged in project activities [4].

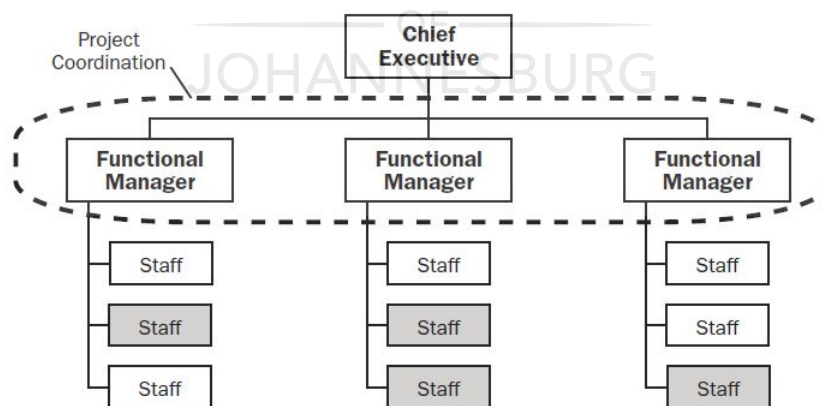


Figure 7: Form of a functional organisational structure [4]

Projectised structures are standalone line units with dedicated staff for each project. Each standalone unit is self-contained with its own process, mechanical, civil and electrical expertise for the same project. The project team reports directly to the project manager and the project

manager has full line authority over the project [3]. The form of a projectised organisational structure is represented in Figure 8. The grey boxes represent staff engaged in project activities [4].

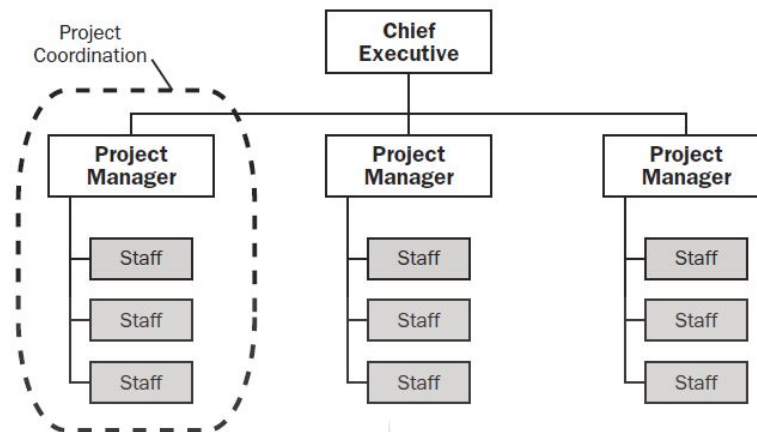


Figure 8: Form of a projectised organisational structure [4]

Matrix structures are combinations of the functional and projectised organisational structures. The hybrid between these two structures provides an organisational form that integrates the desirable features and negates some of the disadvantages of each [3]. The functional and projectised organisational structures represent the extremes, and the power and influence between functional and project managers [4]. Matrix organisations can be categorised as weak (functional), balanced or strong (projectised) matrices [3]. The form of a weak, balanced and strong matrix of an organisational structure is represented in Figure 9, Figure 10 and Figure 11. The grey boxes represent staff engaged in project activities [4].

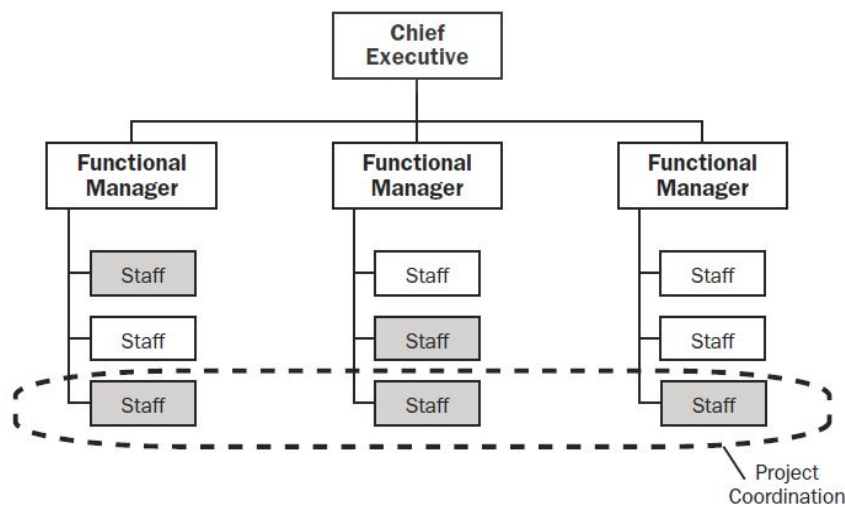


Figure 9: Form of a weak or functional matrix organisational structure [4]

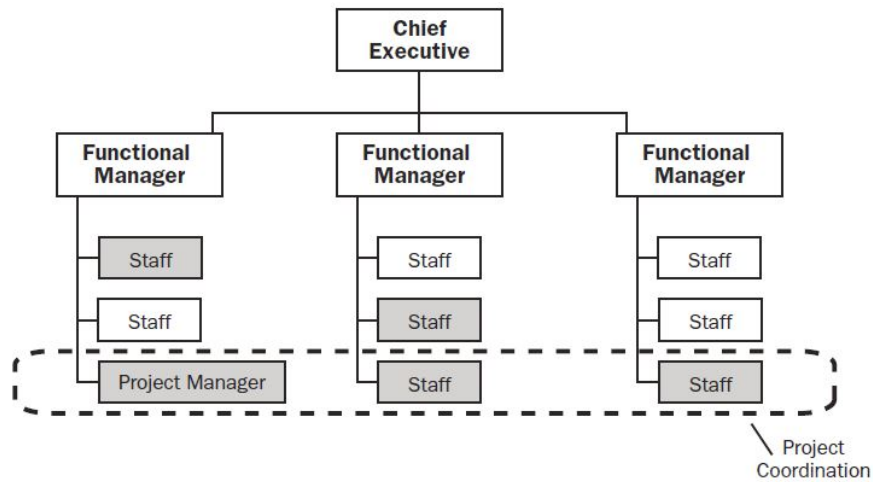


Figure 10: Form of a balanced matrix organisational structure [4]

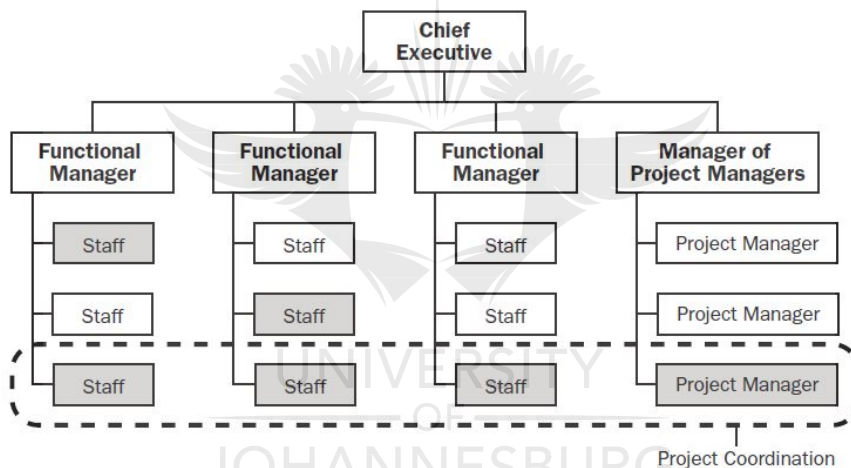


Figure 11: Form of a strong or projectised matrix organisational structure [4]

### 2.2.2. Influence of Organisation Structures on Projects

The organisational structure implemented in a firm is a function of multiple variables and selected to offer the most effective and efficient form for the firm’s requirements. The key area for identification in Section 2.2.1 is the project manager’s level of authority, and roles and responsibilities on a project with reference to the organisational structure type.



The influence of organisational structures on projects for each structure type is indicated in Figure 12. Noteworthy in Figure 12 are the rows boxed in red that are indicative of the project manager's authority and role for each organisational structure type.

Project Characteristics	Organization Structure	Functional	Matrix			Projectized
			Weak Matrix	Balanced Matrix	Strong Matrix	
Project Manager's Authority		Little or None	Low	Low to Moderate	Moderate to High	High to Almost Total
Resource Availability		Little or None	Low	Low to Moderate	Moderate to High	High to Almost Total
Who manages the project budget		Functional Manager	Functional Manager	Mixed	Project Manager	Project Manager
Project Manager's Role		Part-time	Part-time	Full-time	Full-time	Full-time
Project Management Administrative Staff		Part-time	Part-time	Part-time	Full-time	Full-time

Figure 12: Influence of organisational structures on projects [4]

There is a rapid growth in project-orientated firms (projectised organisational structures) and the motives for the increasing popularity can be grouped into four general fields [3]:

1. Speed and responsiveness to market changes.
2. Specialised teams for new product, process or service developments.
3. Strong development and rapid expansion of technological possibilities.
4. Understanding and control of organisation activities through routine progress reporting.

The increase in popularity of project-orientated firms and an international study conducted by Gray *et al* [14] confirms that project matrix (strong matrix) and project team (projectised) structures are perceived as the most effective across all types of projects. Furthermore, a study conducted by Hyväri [15], concludes that the project matrix and project team are rated as the most effective organisational forms of project management while functional organisations the least. The results suggest the strong matrix and projectised organisational forms are the best structures for engineering, procurement and construction (EPC) [16] [15], and engineering, procurement and construction management (EPCM) companies.

The results from previous studies cross-referenced with Figure 12 conclude that the project manager has high authority, manages the project budget and is dedicated full-time to a project in EPC and EPCM organisations. The project manager is the nucleus of a project and has full line authority over a project.

### 2.3. The Project Manager

The background and significance (value) of project management discussed in Section 2.1 indicates a growth in the occupation and the critical implementation of project management tools and techniques for survival in a competitive global market. The organisation structure types and rapid growth in project-orientated firms discussed in Section 2.2 conclude that the project manager is the nucleus of strong matrix and projectised organisational forms. In Section 2.3, "The Project Manager," the competencies, roles and responsibilities, and the influence the project manager has on project success are identified.

#### 2.3.1. Competency of the Project Manager

The tools and techniques of project management are practised by the project manager, and therefore the implementation and success of project management is directly influenced by the project manager. It is critical for the project manager to have a developed skill-set to administer project-related challenges, as well as strong interpersonal skills to manage a project team.

Effective project managers must have a skill-set developed with the following attributes [3] [4]:

1. Technical ability – The project manager must have a strong technical background to assist the project team with any technical problems of a project without relying on outside assistance.
2. Knowledge – The project manager must have a strong knowledge of project management and implementation thereof.
3. Performance – The application of project management knowledge in order to accomplish project deliverables. Performance is a measurement of the project manager's ability to implement project management knowledge.

4. Problem solving – The project manager must be a good problem solver and direct the project team in adopting a problem-orientated philosophy rather than a discipline-orientated approach. A project will always have a set of challenges that need to be resolved with the project manager stepping up and taking the lead.
5. Decision making – The project objectives, goals, trade-offs, risks and strategies are analysed and carried out by the project manager and must be done with mature judgement and responsibility.
6. Leadership – The project manager must have strong leadership ability to mentor, manage and support a project team.
7. Motivation – The project manager must be self-motivated, an example to others, and have the ability to motivate and convince the project team to accept challenging assignments.
8. Communication – The project manager must have excellent communication skills. In client relations, reporting to senior management and managing a project team, the project manager must be open and approachable. The project manager must be communicative to all project stakeholders in every aspect of a project.
9. Negotiation – From project conception through to project close-out, the project manager must have exceptional negotiation skills. All aspects of the project manager's role requires influencing and negotiating with personnel, making project trade-offs, and dealing with challenges and external organisations that have an influence on a project.
10. Conflict management – The project manager must be sensitive to project stakeholders and have the ability to sense interpersonal conflict. Conflict must not be avoided; it must be addressed and managed in a constructive manner. Conflict management results in greater productivity and positive working relationships in the project team.
11. Stress management – Project management is a high stress occupation and the project manager must have the ability to identify and manage stress. A high stress environment can cause the project manager to lose focus, anger quickly and decrease energy levels – all of which are perilous to a project.

12. Ethics – Professionalism and commitment to ethical conduct is critical in a project manager's role. As a team leader, the project manager must demonstrate and comply with laws, standards, regulations, and organisational and professional policies. The project manager must be honest, fair and respectful to all project stakeholders.
13. Political and cultural awareness – In a globalised environment, the project manager must be aware of organisational politics as a result of diversity and misunderstandings between cultures. Cultural diversity must be understood through good communication and capitalising on cultural differences to create a work environment of mutual trust.

### 2.3.2. Roles and Responsibilities of the Project Manager

The roles and responsibilities of the project manager in strong matrix or projectised organisational forms, concluded in Section 2.2.2 as the most efficient organisational structures for EPC and EPCM companies, are many. Figure 13 indicates the typical responsibilities of a project manager in a project management organisation [3].

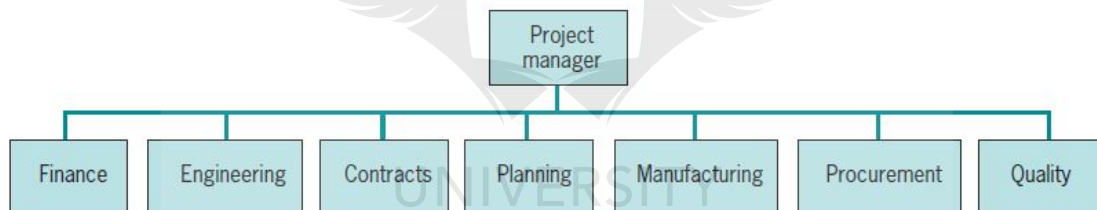


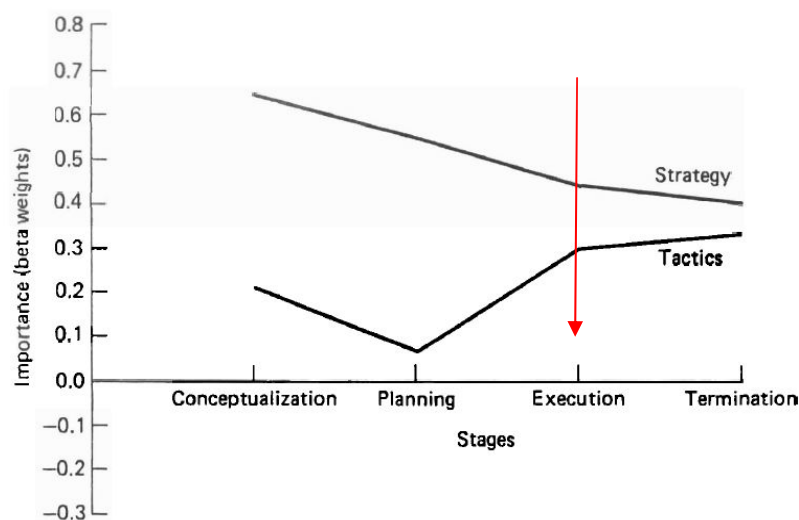
Figure 13: Project management organisation indicating typical responsibilities of a project manager [3]

The project manager is important to initiate any project, and has the responsibility of planning, implementing and completing a project [3]. Pinto and Slevin [17] generated a 10-factor model based on strategic and tactical critical success factors in effective project implementation. The alignment of the 10 factors under the strategic and tactical categories is indicated in Table 1 [17].

**Table 1: Strategic and tactical critical success factors [17]**

Strategy	Tactics
Mission	Client Consultation
Top Management Support	Personnel
Schedule/Plans	Technical Tasks
	Client Acceptance
	Monitoring and Feedback
	Communication
	Troubleshooting

Pinto and Slevin [17] conducted a study to investigate the model and the critical success factors essential to each stage of the project life cycle. The changes in strategy and tactics were plotted for each stage of the project life cycle, as indicated in Figure 14. Particular attention is drawn to the decrease in strategy and increase in tactics during the execution phase of a project. It is important to note that at no point does strategy become unimportant to project success and a successful project manager must be capable of transitioning between strategic and tactical considerations, in sequence, as the project moves forward [17].



**Figure 14: Changes in strategy and tactics across the project life cycle [17]**

It is possible to conclude from Figure 14 and the factors listed in Table 1 that the project manager's roles and responsibilities during the execution phase of a project are not only managing the triple constraint (scope, time and budget) but also communication, client consultation and the project team.

### 2.3.3. The Project Manager and Project Success

Project success is largely influenced by the project manager's ability to manage a project during all stages of the project life cycle. Although this is a biased approach from the EPC or EPCM contractor in terms of completing a project on schedule and within budget, there are three distinct aspects of project performance identified as benchmarks against which the success or failure of a project [18] can be assessed. These are [18] [19]:

1. The implementation process, which includes staying on schedule, on budget and meeting the technical goals of the project.
2. The perceived value of the project, which includes the quality of the project and how the project team views the value and deliverables of the project.
3. Client satisfaction as the external measure of the project effectiveness.

Figure 15 presents the assessment of project success or failure with respect to the three identified areas of performance [19]. Stages two to four are concerned with the project internal efficiency and project management techniques (implementation process) [18]. Stages two to six are concerned with the project's external effectiveness (perceived value and client satisfaction) [18].

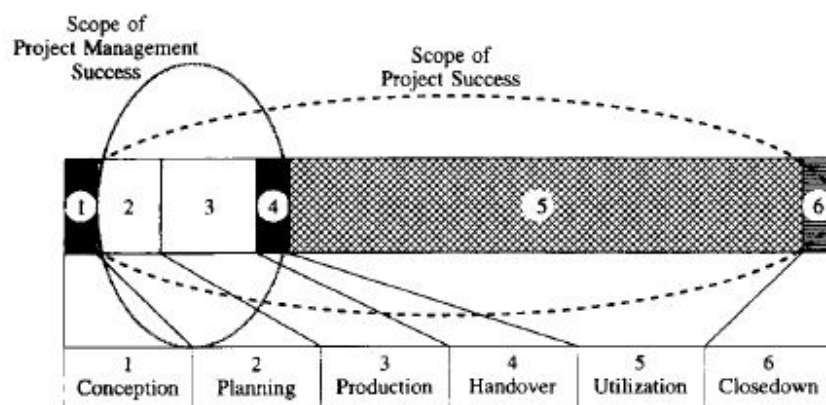


Figure 15: The scope of success within the project life cycle [19]

It is difficult to define what constitutes a failed project but it is worthy to note that all three performance measures are biased as the underlying criteria on which they are based almost certainly contain conflicting elements [18]. A different set of scenarios can therefore dictate whether a project is a success or failure. It is critical to distinguish between project management success or failure and project success or failure. Munns and Bjeirmi [19] argue that the only link between project management failure and the failure of the whole project is if the project is too late or too expensive and can no longer be used.

## 2.4. Replacing the Project Manager (RPM)

The literature review, discussed in Sections 2.1 through to 2.3, identifies the project manager's critical role in the project management process with particular attention to the execution phase of a project. Section 2.4 identifies the effects of replacing the project manager and the requirement for mitigating RPM.

### 2.4.1. RPM and the Project Life Cycle

The investigation into the effects of replacing the project manager is focused on the execution phase of a project when the project level of effort is at its highest. Figure 16 indicates the time distribution of project effort for each stage of a project.

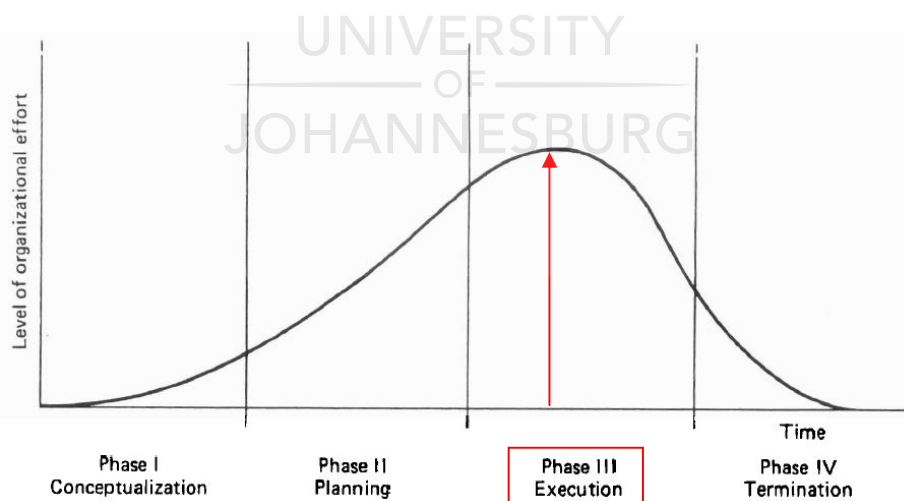


Figure 16: Time distribution of project effort in the four stages of the project life cycle [5]

The project management process is a complex task and continually requires the attention of the project manager [17]. It can be deduced that the execution phase of a project requires a high demand on the project manager's time and resources.

### 2.4.2. Effects of RPM

Many believe that employee turnover in general has a significant negative effect on organisations while others argue that certain levels of turnover are beneficial for the organisation in terms of development and career opportunities [20]. Changes in management personnel have been found by many to have significant negative effects on project performance [20]. Project managers, however, are critical to project management success and organisations should therefore want to mitigate RPM.

A simulation-based laboratory study on software performance conducted by Abdel-Hamid [21] revealed that project management turnover has a significant impact on cost-schedule trade-offs and that successor managers are less committed to inherited problematic project goals [20].

Chapman [22] has investigated the impact and consequences of the orientation phase of a new project manager. Chapman concludes that this phase will be hindered or assisted by a series of issues such as [20]:

- A clear definition of the project brief (system objective),
- A clear definition of the role to be fulfilled (terms of engagement),
- Clear lines of communication and reporting,
- Effective project controls, including the integration devices and configuration management (design change control), and
- The traceability of the decision-making process.

Höffler and Sliwka [23] indicate that a direct drawback of managerial turnover is that a new manager has less information on the subordinate's abilities, resulting in worse task assignment decisions compared to the replaced project manager.

Finally, a survey carried out by Parker and Skitmore [20] revealed that 97% of the respondents strongly agreed that project managers are critical to project success. Furthermore, 85% disagree that that project management turnover has no effect on project performance [20]. To conclude, the survey indicates that project management turnover occurs primarily in the



execution phase of the project life cycle, increasing risk, cost and the probability of project failure [20].

Literature is available on management turnover; however, there appears to be very few studies discussing the replacement of a project manager [24]. Furthermore, limited research has been undertaken to ascertain the percentage of project managers who maintain the position from project initiation to close-out [20].

The literature reviews carried out in preparation for the validation of the importance of the topic, "Investigating the effects of replacing the project manager during project execution," has shown that RPM is a known phenomenon with few studies discussing this issue [24]. In all cases, the results indicate that RPM should be managed better [24].

## 2.5. Chapter Two Conclusion

The literature review concludes Part 1 of the dissertation research process identified in Section 2 and indicated in Figure 1. The chapter introduced project management principles, organisational structures and the project manager, with the intention of recognising the criticality of the project manager in all project phases, with particular emphasis on project execution.

The effects of RPM during the project execution phase were investigated, with very little literature discussing the phenomenon and frequency of RPM. The consensus derived from the literature indicates that RPM primarily occurs in the execution phase of a project life cycle, increasing risk, cost and the probability of project failure [20].

Following the literature review, Chapter 3 will form Part 2 of the research process with identification of the research approach as a methodology to further investigate the effects of RPM.

## Chapter Three: Research Methodology

### 3.1. Research Approach

Qualitative and quantitative research methodologies are the methods that have been implemented in order to fulfil the research objectives. The methodologies were investigated to decide on the most effective research approach to determine the results for investigating the effects of replacing the project manager during project execution.

#### 3.1.1. Qualitative Research Methodology

Qualitative research is characterised by the collection and analysis of textual data in the form of surveys, interviews, observations, etc. Numbers can be used to summarise qualitative data but generally rich, contextual descriptions of the data are used in qualitative research [25]. Qualitative research can be defined as research using methods such as participant observation or case studies, which result in narrative, descriptive account of a setting or practice [26].

A qualitative case study methodology can be identified by type for each study purpose. The case study types defined as follows [27] [28]:

1. Explanatory: Answers to questions to explain the presumed causal links in real-life interventions that are too complex for survey or experimental strategies.
2. Exploratory: Explore situations in which the intervention being evaluated has no clear, single set of outcomes.
3. Descriptive: Describe an intervention or phenomenon and the real-life context in which it occurred.
4. Multiple-case studies: Explore differences within and between cases with the goal to replicate findings across cases.
5. Intrinsic: Intent to better understand a case.
6. Instrumental: Provides insight into an issue or helps to refine a theory.
7. Collective: Studies which are similar in nature and description to multiple case studies.

The advantages and disadvantages of a qualitative research methodology are indicated in Table 2:

**Table 2: Advantages and disadvantages of a qualitative research methodology [29]**

QUALITATIVE	
ADVANTAGES	DISADVANTAGES
Data based on the participants' own categories of meaning	Knowledge produced might not generalise to other people or other settings
Useful for studying a limited number of cases in depth	It is difficult to make quantitative predictions
Useful for describing complex phenomena	It is more difficult to test hypotheses and theories with large participant pools
Provides individual case information	It might have lower credibility with some administrators and commissioners of programmes
Can conduct cross-case comparisons and analysis	It generally takes more time to collect the data when compared to quantitative research
Provides understanding and description of people's personal experiences of phenomena	Data analysis is often time consuming
Can describe in rich detail phenomena as they are situated and embedded in local contexts	The results are more easily influenced by the researcher's personal biases and idiosyncrasies
The researcher almost always identifies contextual and setting factors	
The researcher can study dynamic processes	
The researcher can use the primarily quantitative method of grounded theory to inductively generate a tentative but explanatory theory about a phenomenon	
Can determine how participants interpret constructs	
Data are usually collected in naturalistic settings	
Qualitative approaches are especially responsive to local situations, conditions, and stakeholders' needs	
Qualitative researchers are especially responsive to changes that occur during the conduct of a study and may shift the focus of their studies as a result	
Qualitative data in the words and categories of participants lend themselves to exploring how and why phenomena occur	
One can use an important case to vividly demonstrate a phenomenon to the readers of a report	
Determines idiographic causation	

A descriptive case study type was selected for the qualitative research method. The case study presented in Section 3.2 is through the eyes of the author who, as a project engineer in an EPC organisation, experienced the effects of replacing the project manager during the execution phase of a project. The findings of the descriptive case study should be considered as preliminary rather than conclusive as no data analysis techniques were implemented.

### 3.1.2. Quantitative Research Methodology

Quantitative research is the data collection through surveys administered to a sample or subset of the entire population to generalise or make inferences. The findings are evaluated and quantifiable results pertaining to a topic published through descriptive statistics. The quantitative approach is useful in cases where little is known about a topic [25].

The advantages and disadvantages of a quantitative research methodology are indicated in Table 2:

Table 3: Advantages and disadvantages of a quantitative research methodology [29]

QUANTITATIVE	
ADVANTAGES	DISADVANTAGES
Testing and validating already constructed theories about how and why phenomena occur	The researcher's categories that are used might not reflect local constituencies' understandings
Testing hypotheses that are constructed before the data are collected	The researcher's theories that are used might not reflect local constituencies' understandings
Can generalise research findings when the data are based on random samples of sufficient size	The researcher might miss out on phenomena occurring because of the focus on theory or hypothesis testing rather than on theory or hypothesis generation
Can generalise a research finding when it has been replicated on many different populations and subpopulations	Knowledge produced might be too abstract and general for direct application to specific local situations, contexts, and individuals
Useful for obtaining data that allow quantitative predictions to be made	
The researcher may construct a situation that eliminates the confounding influence of many variables, allowing one to more credibly establish cause-and-effect relationships	
Data collection using some quantitative methods is relatively quick	
Provides precise, quantitative, numerical data	
Data analysis is relatively less time consuming	
The research results are relatively independent of the researcher	
It may have higher credibility with many people in power	
It is useful for studying large numbers of people	

A quantitative research approach was selected to determine the effects of replacing the project manager during project execution as literature has shown that RPM is a known phenomenon with few studies discussing this issue [24]. The case study provides a preliminary investigation based on the author's experience and therefore a quantitative research approach will permit further investigation from random responses in a selected sample size. Section 3.3 presents the dissertation survey and the web-based survey results are presented in Chapter 4.

## 3.2. Case Study – Qualitative Research Method

### 3.2.1. Project Background

A world renowned gold mining company required a new cyanide make-up facility and piping distribution network at one of its existing gold processing plants in Ghana, West Africa. The upgrade was necessary as the existing cyanide network was not ICMI compliant. Strict deadlines were put in place as the plant audit and compliance review was under pressure from external governmental factors. The re-measurable contract was based on the supply, fabrication and installation of SMPP and E&I governed by the FIDIC Conditions of Contracts for Construction – The Red Book.

A projectised organisational structure was implemented with the project manager having full line authority over the project. The high-level project organogramme is indicated in Figure 17:

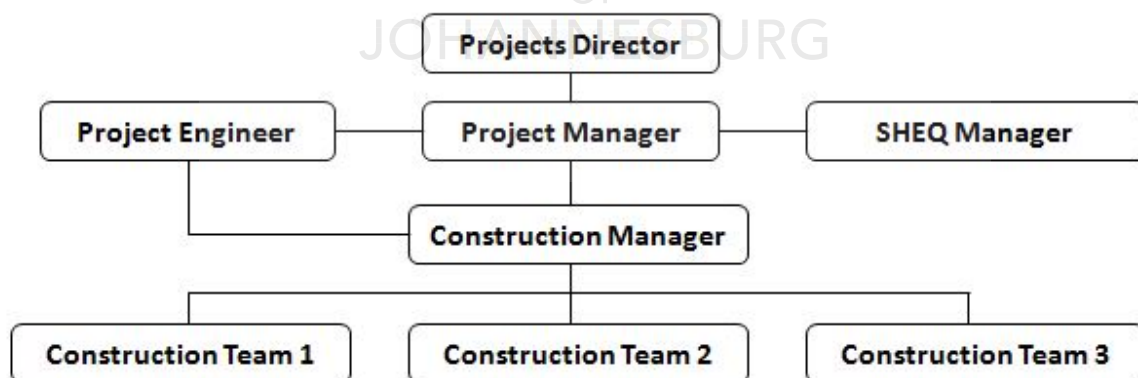


Figure 17: Project organogramme

### 3.2.2. Project Manager Replacement

In the initial stages of construction, the project manager resigned and a new project manager appointed. The newly appointed project manager had previously been in operations for the organisation with no contractual experience. Given that the organisational structure was projectised and the involvement of the project manager full-time, the new project manager was site-based but only partially involved in the day-to-day construction operations. Schedule, budget and scope were managed remotely by the appointed project engineer. Furthermore, no official handover was initiated by either project manager – resigned project manager out, new project manager in.

### 3.2.3. Effects and Consequences of RPM

The effects of replacing the project manager during project execution for the case study, with respect to the identified key areas of project management raised in the questionnaire design and survey to follow in Chapter 4, are discussed in the following sections.

#### 3.2.3.1. Project Schedule and Performance

The project schedule was initially base-lined with a total project duration of 10 months. The monitoring and tracking of the schedule and performance was carried out by the project engineer and not the new project manager. Information was fed from site to update the project progress with little to no input from the new project manager who was site-based.

There were many factors that affected the project performance and schedule. The project was a brown fields project with many site routing difficulties, and site instructions and variation orders were plentiful (scope creep). Some of the site instructions were necessary to continue with the work, however, many of the site instructions were for additional works, margins were low and cutting into the project schedule float. The new project manager was not focused on the potential delay of the additional scope of work, how it would affect all tasks downstream, but rather the additional revenue. The scope of work increased, resource levels were exhausted and the project became overdue by six months.

#### 3.2.3.2. Cost and Cash Flow

The project schedule was not managed by the new project manager. The additional scope of work was not effectively incorporated into the project schedule and as the scope increased, the

project deadlines became more difficult to achieve. In order to achieve the deadlines, resource loading had to be implemented and construction time extended. The trade off between the increased scope (revenue) and project costs associated with preliminary and generals was not investigated. The poor contractual management and costs incurred, significantly reduced the projected profit margins.

### 3.2.3.3. Project Risk

The agreements with the new project manager and client, and the poor management of the triple constraint – scope, time and budget – resulted in an increase in project risk. The cause-and-effect of the triple constraint mismanagement with deadlines near impossible to achieve increased the project risk in terms of delivering a quality product within the allowable time frame.

The contracting company's principal risk was the contractual penalties for the late delivery, with a maximum fee of 5% of the contract value. The imposed penalties would result in the contracting company making a loss on the project after significantly reduced profit margins from scope creep.

The principal risk from the client perspective was the plant ICMI compliance under pressure from external governmental factors. Non-compliance of the plant would result in the client's inability to produce gold, its sole business objective.

### 3.2.3.4. Communication

As a result of the new project manager's lack of involvement in project decisions, the lines of reporting were skewed, with information being fed from the construction manager to the project engineer. The new project manager and construction manager were site-based and the communications plan and lines of authority misinterpreted and never reviewed.

The incorrect communication channels resulted in misinterpretation of instructions, insufficient project feedback and loss of control of site activities. Internal project team meetings were never scheduled for project progress and resources were never suitably allocated to outstanding tasks. The planning of major milestone activities for project completion was not effectively communicated to the project team and resulted in team confusion and inevitably, conflict.

### **3.2.3.5. Loss of Information**

The replaced project manager made agreements with the client and subcontractors. The agreements were in the form of scope, cost, completion dates, payment milestones and special deliverables. The agreements were made in personal meetings, telecommunications and email correspondence but were never officially recorded or archived for future reference.

The agreements made between the parties could never be verified and the loss of information resulted in conflict and a hostile relationship between the parties concerned. The effects of the loss of information were not only seen during the project, but carried over to end sustainable business relationships critical for future endeavours.

### **3.2.3.6. Client's Trust**

The client had a well-established relationship with the contracting company and new project manager. The client viewed the new project manager as competent, involved (site-based) and appreciated the commitment to the additional scope of work under the given circumstances.

The replacement of the project manager did not affect the client's trust and all decisions made were in the best interest of the client. However, these commitments and lack of project management experience had an adverse affect on the contracting company.

### **3.2.3.7. Team Motivation**

The team motivation decreased when the new project manager was appointed. The conflict between the new project manager and construction manager was evident – decisions could never be agreed upon and the new project manager's direct involvement with site instructions and construction crew without the construction manager's consent heightened confusion within the project team. The confusion with reporting and conflicting instructions resulted in the de-motivation of the project site team.

## **3.2.4. Case Study Project Summary**

The new project manager relied on the project engineer to make decisions and carry out instructions and acted as part-time project manager with little to no involvement with project management duties.



The case study project summary is indicated in Table 4.

**Table 4: Case study project summary**

CASE STUDY: CYANIDE IMPROVEMENT PROJECT			
PROJECT MANAGEMENT KEY AREA	INITIAL	RESULT	COMMENTS
Communication	Good	Poor	Lines of authority skewed.
Project Schedule and Performance	10 months	16 months	Six months over schedule. Significant scope creep.
Documentation and Information Sharing	Good	Poor	Agreements and subcontractor conflict.
Client's Trust	Good	Good	No change.
Project Risk	Low	Medium	Increased with scope creep.
Team Motivation	Good	Poor	Reporting lines and authority conflict.
Cost and Cash Flow	Good	Poor	Project over budget by \$1m. Profit margins thinned.

### 3.3. Survey – Quantitative Research Method

#### 3.3.1. Survey Strategy

Investigating the effects of replacing the project manager was undertaken in a web-based survey. A questionnaire was developed and targeted at three different levels of a typical project team, namely:

- Senior management,
- Project managers, and
- Project team members, primarily consisting of project engineers.

The population approached to complete the survey was selected by means of a professional social network (LinkedIn). The initial communication and request for participation was targeted primarily at South African project houses providing engineering, procurement and construction (EPC), as well as engineering, procurement and construction management (EPCM) services to the mining industry. Product design and development, as well as specialised equipment manufacturers primarily servicing mining or similar industries were also approached.

The flow chart in Figure 18 was used to collect and tabulate the data for analysis and visually represent the results.

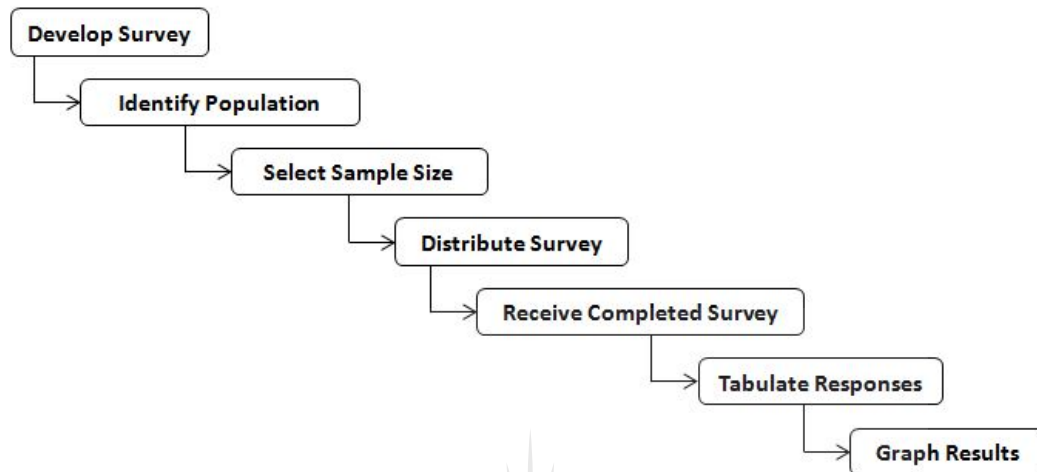


Figure 18: Data collection flow chart

### 3.3.2. Questionnaire Design

A questionnaire was designed for the distribution and collection of meaningful data for analysis. The questionnaire was designed to limit the number of questions and reduce the overall time required to complete the survey. The decision to limit the questionnaire and maintain simplicity was taken with the intention of motivating potential respondents to complete the survey.

The questions were strategised as follows:

- Four out of the 12 questions were dedicated to demographics to determine the array of respondents.
- One out of 12 questions was dedicated to the frequency of project manager replacement during project execution.
- One out of 12 questions was dedicated to the circumstances for a project manager departing a project during the execution phase of a project.
- Three out of 12 questions were dedicated to the net effect of replacing the project manager during project execution.

- Two out of 12 questions were dedicated to the importance of the project manager’s role in project success and failure.
- One out of the 12 questions was dedicated to the controls to limit the effects of replacing a project manager during project execution (handover facilitation).

The questionnaire flow diagram is depicted in Figure 19.

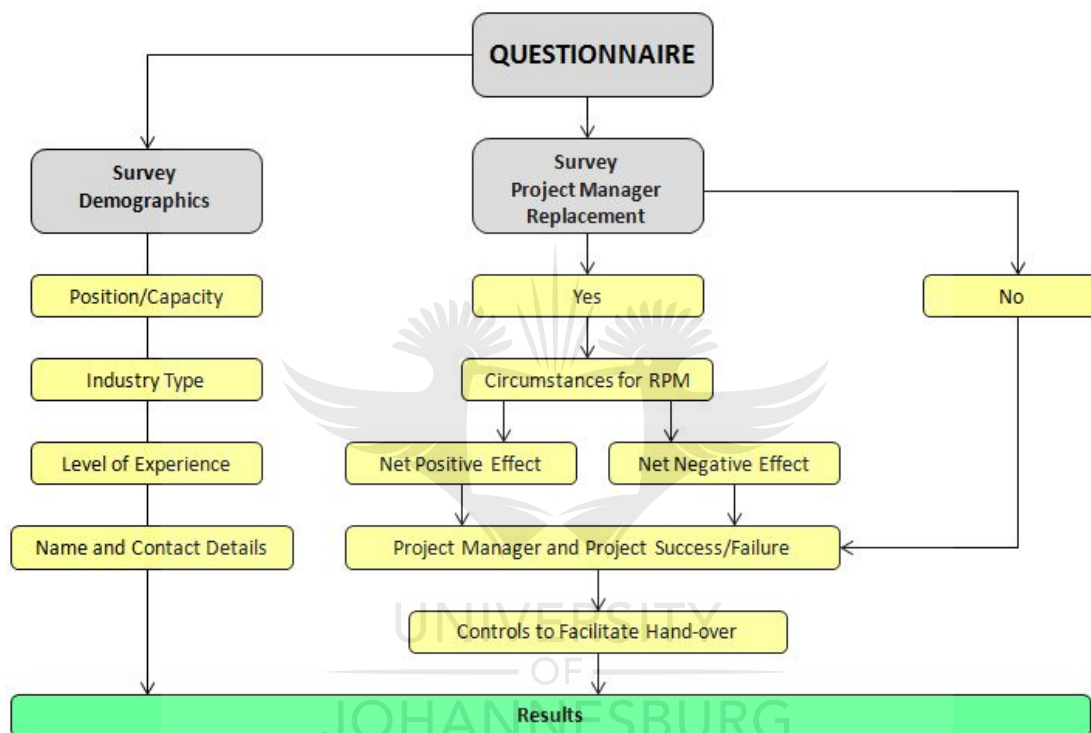


Figure 19: Questionnaire flow diagram

### 3.3.3. Sample Size

The sample size was determined utilising a formula for calculating a sample for proportions. For large populations, Equation 1 can be utilised to yield a sample size for a specified error on a binomial proportion [30].

$$n_0 = \left(\frac{Z_{\alpha}}{E}\right)^2 p(1 - p) \dots\dots\dots (1)$$

Where:

$n_0$  = The sample size,

$Z_{\frac{\alpha}{2}}$  = Level of confidence, where  $\frac{\alpha}{2}$  is the area in one tail,

$p$  = The estimated proportion,

$E$  = Margin of error.

Using Equation 1, the calculation was performed under the following assumptions:

$Z_{\frac{\alpha}{2}} = 1.96$  for a 95% level of confidence,

$p = 0.5$  for maximum variability, and

$E = 10\%$  as the accepted margin of error for small sampling.

Yielding:

$$n_0 = \left(\frac{1.96}{0.1}\right)^2 0.5(1 - 0.5)$$

$$n_0 = \underline{97 \text{ samples}}$$

To conduct the study, a sample size of 80 was selected for practical purposes, and a finite population correction for proportions using Equation 2 was used to adjust the number of samples required.

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \dots \dots \dots (2)$$

Where:

$N$  = The selected sample size.

Using Equation 2, the calculation was performed under the following assumption:

$N = 80$  for the population size equal to the selected sample size.

Yielding:

$$n = \frac{97}{1 + \frac{(97 - 1)}{80}}$$

$$n = \underline{44 \text{ samples}}$$

The approach chosen to successfully increase the number of respondents was to send personal emails via a professional social network with a strategised questionnaire to provide enough information for analysis, but limiting the number of questions to 12. Four out of the 12 questions were for demographic purposes to determine the array of respondents. Although these strategies were put in place to increase the number of respondents, a total response rate of 56% was achieved.

In conclusion, the total number of respondents with  $n = 45$  falls within the calculated sample size range of  $n = 44 \pm 4.4$  to cater the margin of error and a 95% level of confidence. The number of respondents was therefore found to be acceptable and the survey results presented in Chapter 4 are worthy for analysis.

### 3.4. Chapter Three Conclusion

The research methodology concludes Part 2 of the dissertation research process identified in Section 2 and indicated in Figure 1. The chapter introduced qualitative and quantitative research methodologies – the definitions and advantages and disadvantages of each.

Both research methodologies were identified for the dissertation research approach:

1. A qualitative research method in the form of a case study.
2. A quantitative research method in the form of a web-based survey.

A case study identified that the net effect on a project during RPM is negative with emphasis on the identified key areas of project management. The findings of the descriptive case study should be considered as preliminary rather than conclusive as no data analysis techniques were implemented.

The front-end of the quantitative research methodology was investigated by determining the survey strategy, questionnaire design and calculating the required sample size. The case study provided a preliminary investigation based on the author's experience and a quantitative research approach will permit further investigation to conclude the effects of RPM. The presentation and interpretation of the survey are presented in Chapter 4.

## Chapter Four: Presentation and Interpretation of Survey

### 4.1. Survey Demographics

The survey demographics were kept to a minimum and only the most important questions to ensure a widespread distribution of respondents were put forward. The survey captured the following information:

- Professional capacities,
- Industry type, and
- Industry experience.

#### 4.1.1. Professional Capacities

Of the total number of respondents (100%, n=45), senior management made up 22% (n=10), project managers 36% (n=16) and project team members 42% (n=19). Figure 20 graphically presents the percentage distribution for the professional capacities of the respondents.

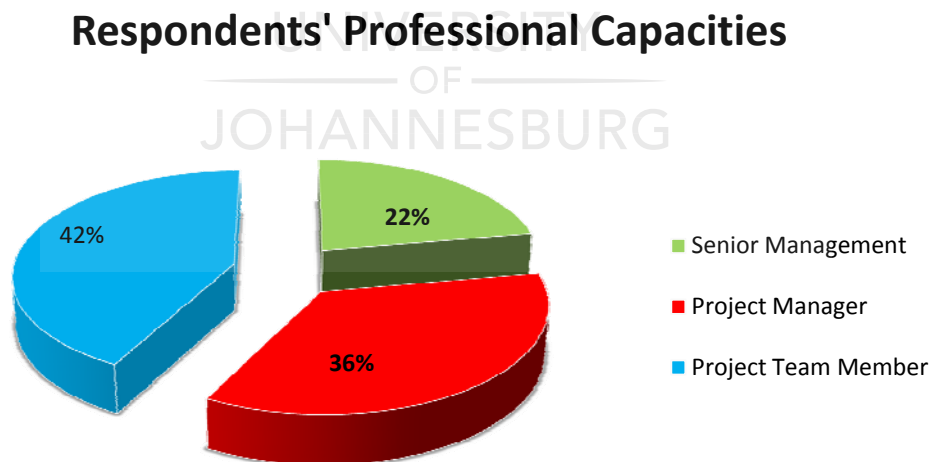


Figure 20: Percentage distribution of respondents' professional capacities

#### 4.1.2. Industry Types

The industries in which the respondents are currently active are predominantly the mining industry (53%, n=24), many of which are EPC/EPCM organisations, followed by “other”, comprising 22% of the total respondents, who are specifically identified to be involved in EPC/EPCM business models. Figure 21 graphically presents the percentage distribution of the industries that the respondents are currently active.

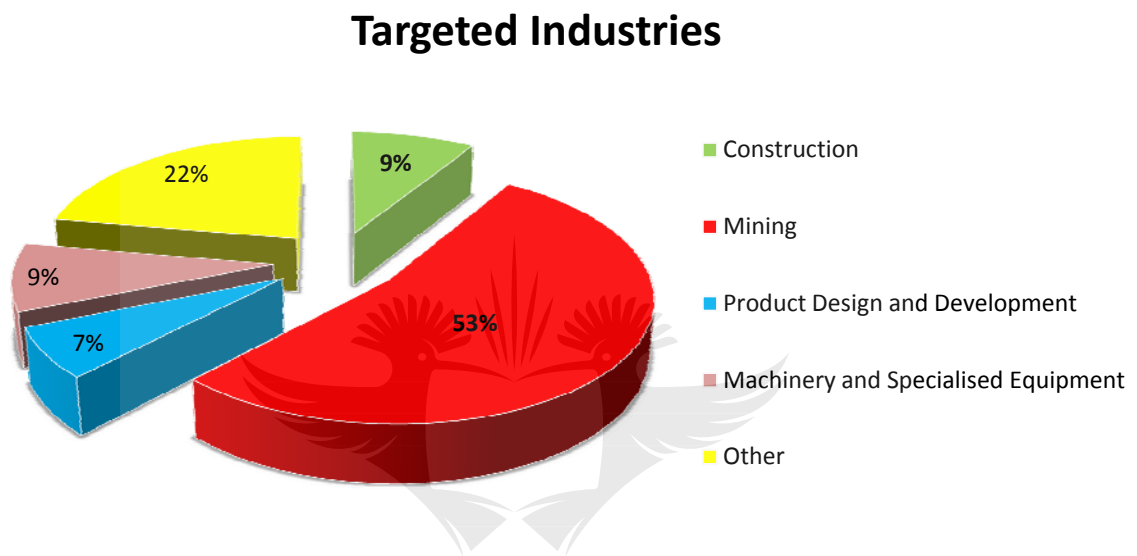


Figure 21: Percentage distribution of respondents' industries

### 4.1.3. Industry Experience

Industry experience has a large influence on the survey results and the population approached was strategised such that a range of industry experience was achieved. The majority of the respondents (31%, n=14) had five to 10 years experience in the industry in which they are currently active. Figure 22 graphically presents the percentage distribution of the respondents' experience in the field in which they are currently active.

#### Respondents' Industry Experience

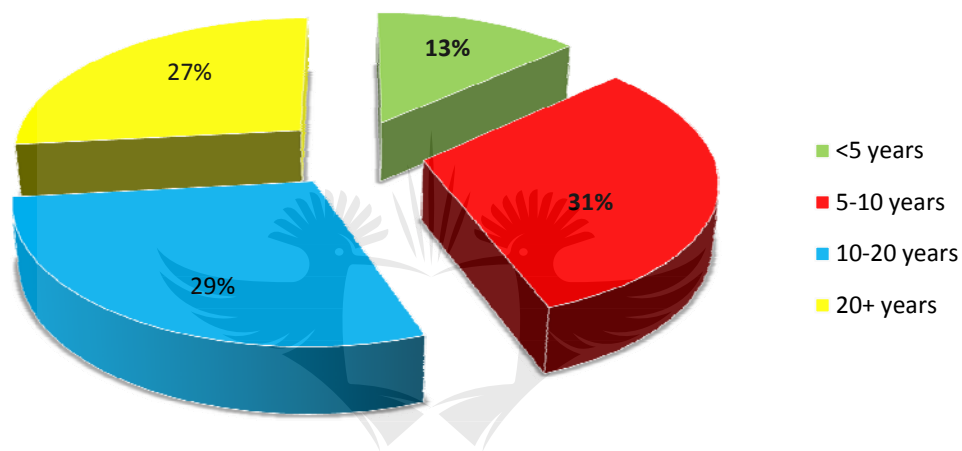


Figure 22: Percentage distribution of respondents' industry experience

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## 4.2. Project Manager Replacement Survey and Interpretation of Results

### 4.2.1. Frequency of Replacing the Project Manager

Almost all respondents (93%, n=42) confirmed that they have experienced RPM and only 7% (n=3) responded that RPM had not been experienced in their work environment. Figure 23 graphically presents the percentage distribution of the respondents witnessing RPM during the execution phase of a project.

### Frequency of Project Manager Replacement

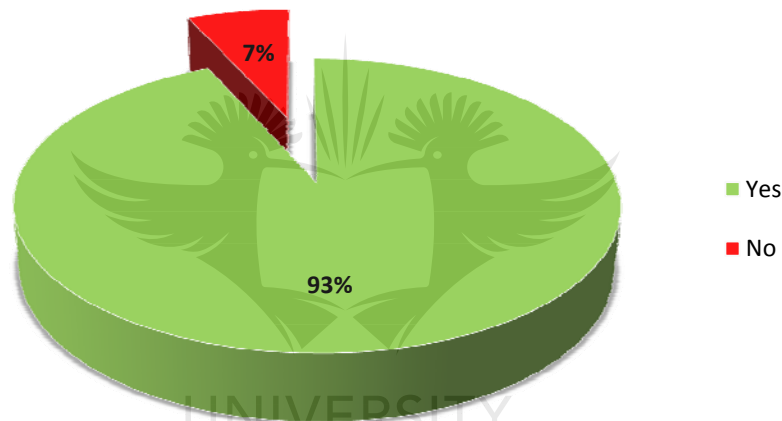


Figure 23: Percentage distribution of respondents witnessing replacement of the project manager

The frequency of a project manager being replaced on a project during project execution is extremely high. The importance of the project manager with respect to the outcomes of a project was outlined in Section 2.3. The high turnover of project managers and the critical role of project managers during all phases of a project indicate that selection of the project manager is a critical task. Project management principles, interpersonal skills and commitment of the project manager to carry out the project from conception to final close-out are crucial to a project.

#### 4.2.2. Net Effect on a Project During RPM

The response to the net effect on a project during RPM, 62% (n=26) confirmed that the project was negatively affected, 31% (n=13) positively affected and only 7% (n=3) confirmed that RPM had no effect on the project. Figure 24 graphically presents the percentage distribution of the respondents' experience on the influence and effects of RPM during the execution phase of a project.

### Net Effect on a Project as a Result of RPM

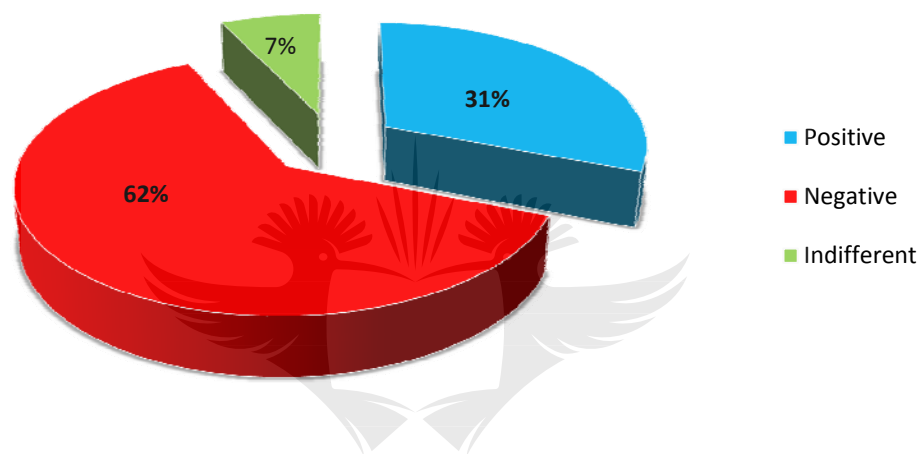


Figure 24: Percentage distribution of respondents' experience on the net effect of a project during RPM

The net effect on a project as a result of the project manager departing the project is subject to the project status and the project manager's ability to execute the project. Vartiainen and Pirhonen [31] studied the perceptions of project managers on RPM and identified two classes of RPM. The two classes were identified as follows [24]:

1. The project manager had to be replaced in order to rescue a troubled project.
2. The replacement was considered a pertinent part of the project process.

The survey was carried out to ascertain the net effect of RPM during the execution phase of a project. Point number two is void as a project manager could be replaced in a certain project phase, however, RPM would not be part of a pertinent project process during the execution phase (or any other particular phase of a project).

Two classes were identified from the survey results:

1. The project manager had to be replaced in order to rescue a troubled project and resulted in a net positive effect, in agreement with the survey carried out by Vartiainen and Pirhonen [31].
2. The project manager resigned and was replaced reluctantly by the organisation and resulted in a net negative effect.

The statistics of the survey confirm that the net effect on a project as a result of RPM affects a project more negatively than positively.

#### 4.2.3. Motives for a Project Manager Departing a Project

Section 4.2.1 identified the frequency of RPM and Section 4.2.2 identified the possible effect on a project as a result of RPM during the execution phase of a project. The possible circumstances for the project manager departing a project are:

- Career motives and personal development (including internal transfer),
- Job dissatisfaction,
- Company structure and/or culture,
- High stress environment, or
- Other (respondent to specify).

The survey confirmed that career motives (48%, n=20) followed by “other” (24%, n=10) are the major motives for the project manager relieving his/her duties on a project. The 24% (n=10) for “other” is attributed to a client’s request for removing the project manager from a project as a result of poor performance or a bitter client-project manager relationship. The company culture and/or structure has quite a large effect on a project manager departing a project with 19% (n=8) share.

Figure 25 graphically presents the percentage distribution for the motives of a project manager to depart a project during project execution.

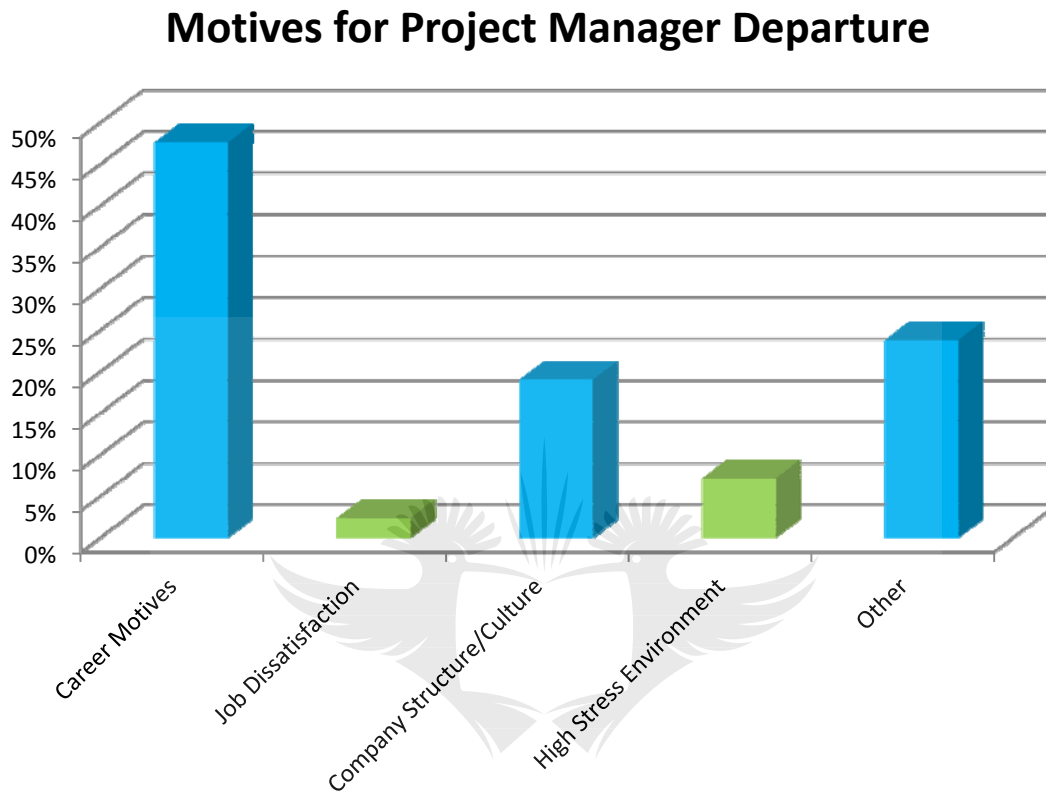


Figure 25: Percentage distribution of respondents' motives for a project manager departing a project

It is characteristic of a project manager to be driven for success and therefore the most common motive for a project manager to depart a project is career orientated. "Other" attributing to the client's request to remove the project manager from a project corresponds to the RPM net positive effect in Section 4.2.2 and the increase in client's trust in Section 4.2.4 to follow.

It is expected that job dissatisfaction plays a minor role in project manager departure as project managers are generally career driven and have followed the path of project management for personal job satisfaction. Project managers undergo a large amount of stress as the project outcomes are dependent on their ability to execute the project. It is therefore surprising that the high stress environment plays little role (7%, n=3) in the project manager departing the project.

#### 4.2.4. Impact on a Project

As outlined in Section 4.2.2, the net effect of RPM on a project can either have a positive or negative effect. The effect of the RPM can impact the project in key areas of project management, namely:

- Project schedule and performance,
- Cost and cash flow,
- Project risk,
- Communication,
- Documentation and information sharing (including loss of information),
- Client's trust and confidence in the new project manager,
- Project team motivation, and
- Other (respondent to specify).

Figure 26 graphically presents the cumulative percentage distribution summary for the positive and negative impacted areas on a project as a result of RPM. The assumption was made that the project deliverables in terms of quality are not compromised through RPM i.e. the final product is always within the set quality parameters upon project handover. The project management triangle in Figure 4 and TRIJECT model in Figure 5 signifies the ever presence of quality and customer satisfaction, but not identifying quality as a driving constraint. However, should quality have been a frequently impacted area during RPM, this could have been identified by the respondents as "other".

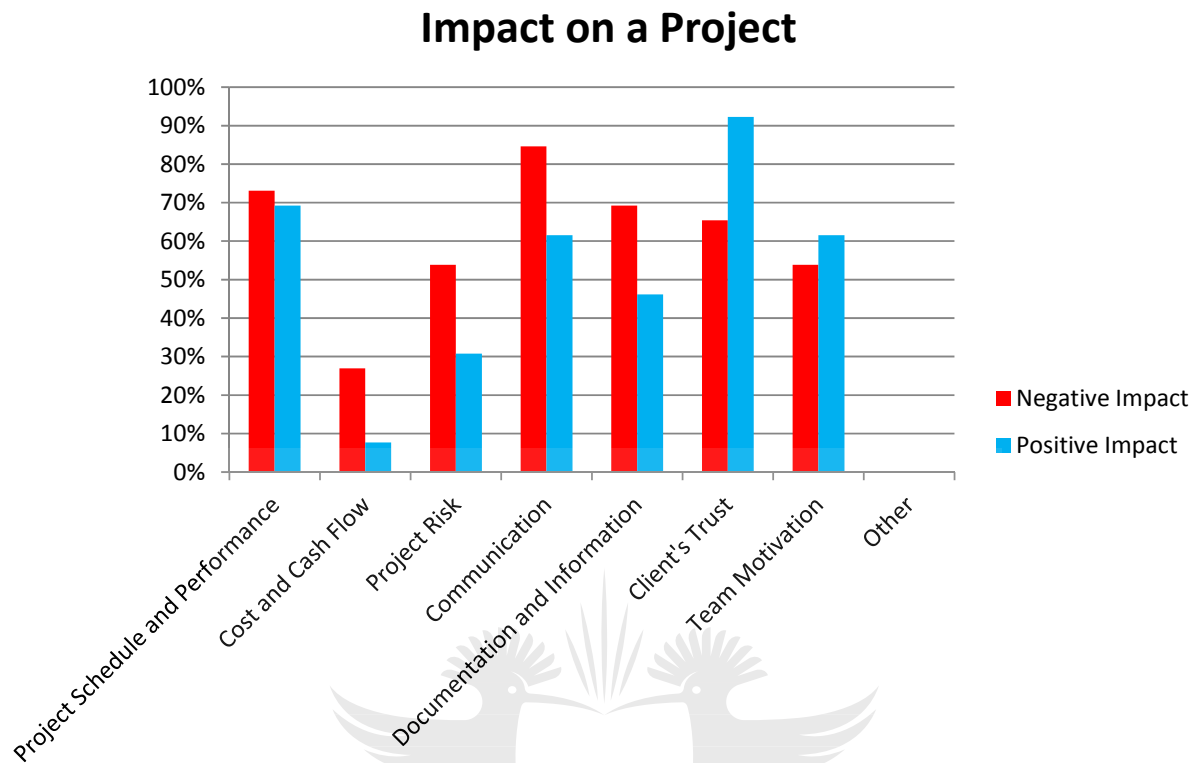


Figure 26: Cumulative percentage distribution of responses to impacted areas as a result of RPM

#### 4.2.4.1. Net Negative Impact on a Project

The results of the project management key areas that are impacted by negatively affected projects as a result of RPM (62%, n=26) are tabulated in Table 5. The impacted key areas are ranked according to the most affected area to the least.

Table 5: Project management key areas impacted by negatively affected projects

NEGATIVELY AFFECTED PROJECTS			
PROJECT MANAGEMENT KEY AREA	NO. OF RESPONSES TO KEY AREA	% OF RESPONSES TO KEY AREA	RANKING OF NEGATIVELY IMPACTED AREA
Communication	22	85%	1
Project Schedule and Performance	19	73%	2
Documentation and Information Sharing	18	69%	3
Client's Trust	17	65%	4
Project Risk	14	54%	6
Team Motivation	14	54%	5
Cost and Cash Flow	7	27%	7
Other	0	0%	8

The results tabulated in Table 5 confirm that the three highest areas of project management that are impacted negatively as a result of RPM are communication (85%, n=22), project schedule and performance (73%, n=19), and documentation and information sharing (69%, n=18).

Communication ranked as the number one impacted area corresponds with Chapman's [22] investigation that clear lines of communication and reporting will be an issue when RPM is experienced. The case study presented in Chapter 3 also demonstrated that communication and the lines of reporting affected the project negatively. Communication, listed as a tactical critical success factor in Table 1 as the project moves forward into the execution phase, demonstrates a large threat to the project in terms of project management processes and the overall success of a project.

Project schedule and performance, concatenated as a single key area of project management as a result of managing schedule and additional scope (scope creep) to meet the technical goals of the project, is ranked as the second highest impacted area. Table 1 demonstrates the strategic critical success factors of schedule and planning before the project moves into execution. The project manager has grown with the project, has a good understanding of the schedule and has a clear goal of meeting the project deliverables. RPM results in the replacement project manager having to track the schedule blindly without prior involvement in the development process. The affected project schedule and performance complements Höffler and Sliwka's [23] studies that identified that drawbacks of managerial turnover results in the weakening of task assignment decisions of the replacement project manager. The deteriorated project schedule and performance of a project poses a large threat to the project as these two key areas are critical to the project success and managing the triple constraint – scope, time and budget.

Documentation and information sharing is ranked as the third highest impacted area of RPM. The loss of documentation, correspondence, agreements, etc. complements Chapman's [22] identified issues for the consequences of the orientation phase of a new project manager. The identified issues include effective project controls and the traceability of the decision-making process. A replacement project manager has less information on the project than subordinates may have; sharing of documentation and information may be limited and the decisions made by the replacement project manager are based on the available information. These decisions may not always be correct and therefore the decisions made could negatively impact a project.

Client's trust ranked as the fourth highest impacted area of RPM can be attributed to the client's confidence and trust in the replacement project manager. The replaced project manager may have built a good relationship with the client, a good understanding and value of

the work to be performed. The replacement project manager stepping into a new role, having to fill big shoes and tie up loose ends, may put the client in doubt of the project manager's capability. Furthermore, the first three ranked impacted areas of a negatively affected project will create uncertainty of the project's future.

Project risk is ranked as the sixth highest impacted area and is attributed to multiple project management key areas. Direct project risk in terms of time-to-completion and managing scope will increase as the project schedule and performance decreases. Organisation and client relationship risk increases as the project underperforms, and communication and reporting strategies are dwindled.

Team motivation ranked as the seventh highest impacted area is also linked to multiple project management key areas. Communication, project schedule and performance, and information sharing are all factors in motivating project personnel. The management turnover, trust, lack of communication, weak interaction and personal involvement, as well as the decline in project performance all have an impact on the work environment and team motivation.

Cost and cash flow ranked last corresponds with recent research that schedule and scope (Project schedule and performance) are more important than cost in all stages of the project life cycle [3].

#### 4.2.4.2. Net Positive Impact on a Project

The results of the project management key areas that are impacted by positively affected projects as a result of RPM (31%, n=13) are tabulated in Table 6. The impacted key areas are ranked according to the most affected area to the least.

Table 6: Project management key areas impacted by positively affected projects

POSITIVELY AFFECTED PROJECTS			
PROJECT MANAGEMENT KEY AREA	NO. OF RESPONSES TO KEY AREA	% OF RESPONSES TO KEY AREA	RANKING OF POSITIVELY IMPACTED AREA
Client's Trust	12	92%	1
Project Schedule and Performance	9	69%	2
Communication	8	62%	3
Team Motivation	8	62%	4
Documentation and Information Sharing	6	46%	5
Project Risk	4	31%	6
Cost and Cash Flow	1	8%	7
Other	0	0%	8



The results tabulated in Table 6 confirm that the three highest areas of project management that are impacted positively as a result of RPM are client's trust (92%, n=12), project schedule and performance (69%, n=9), and communication (62%, n=8).

Client's trust ranked as the number one highest impacted area of RPM can be attributed to "other" identified in Section 4.2.3, as the client's request to remove the project manager from a project. A sour client-project manager relationship caused by a series of conflict or underperformance could have resulted in the client requesting RPM. The client's trust increases as the replacement project manager is assigned in order to rescue a troubled project.

Project schedule and performance is ranked as the second highest impacted area. The request for the client to replace the project manager corresponds with the improved project schedule and performance and the requirement to rescue a project.

Communication ranked as the third highest impacted area of RPM also corresponds to the client's request to replace the project manager. Improved communication channels between the client and project team and improved reporting systems ensure that the project has clarity, and that all stakeholders are conscious of project progress and potential delays.

Team motivation ranked as the fourth highest impacted area is linked to multiple project management key areas. Client's trust, communication, project schedule and performance are all factors in motivating project personnel. The replacement project manager may have better interpersonal skills to compromise, negotiate and motivate the project team.

Documentation and information sharing is ranked as the fifth highest impacted area of RPM. The replacement project manager, with the client's support, better communication skills, and a motivated project team, builds trust and an improved sharing of documentation and information results.

Project risk is ranked as the sixth highest impacted area and is attributed to the replacement project manager. Direct project risk in terms of time-to-completion and managing scope will decrease as the project schedule and performance increases. Organisation and client relationship risk decreases as the project performs, and communication and reporting strategies are improved.

Cost and cash flow ranked last corresponds with recent research that schedule and scope (Project schedule and performance) are more important than cost in all stages of the project life cycle [3].

#### 4.2.5. Project Manager in Project Success and Failure

The survey identified the respondents' evaluation of the importance of the project manager's role in project success and failure. The survey questions were presented in a Likert scale as depicted in Figure 27:

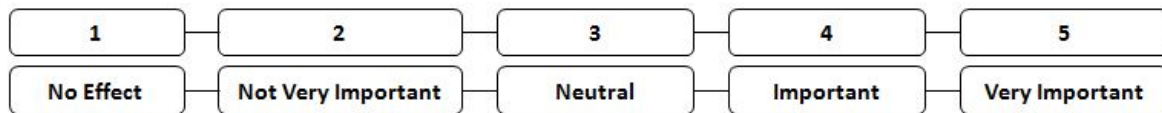


Figure 27: Likert scale used to determine the importance of the project manager's role in project success and failure

The project manager's role in project success was identified to be 78% (n=35) as "very important" and 22% (n=10) as "important". No respondents identified the project manager's role to have "no effect," "not very important" or "neutral".

The project manager's role in project failure was identified to be 56% (n=25) as "very important," 40% (n=18) as "important" and 4% (n=2) as "neutral". No respondents identified the project manager's role to have "no effect" or "not very important".

As a comparison between the project manager's role in project success and failure, the collaborated percentage distribution is graphically presented in Figure 28.

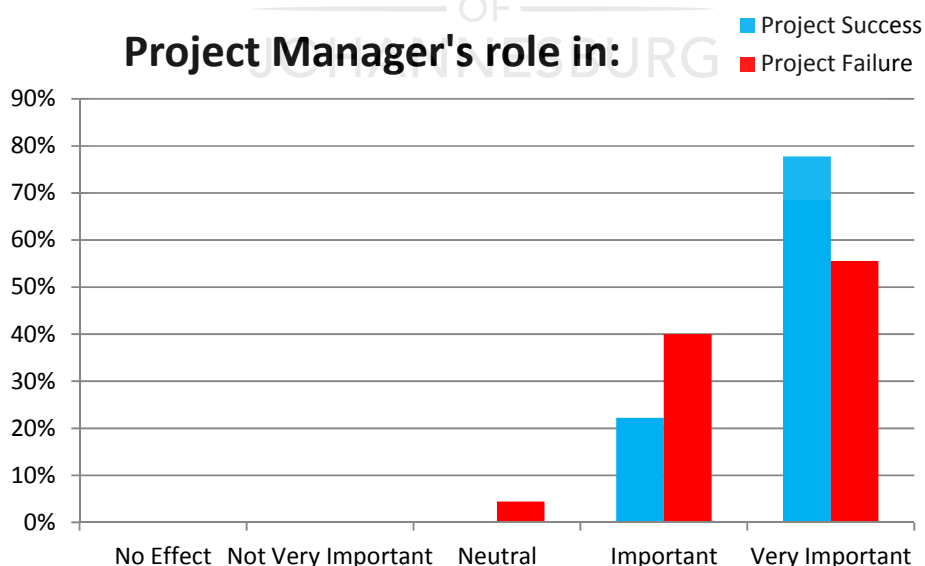


Figure 28: Percentage distribution summary of the project manager's role in project success and failure

The results graphically presented in Figure 28 illustrate that all respondents specified the project manager's role in project success as important. The results complement the survey carried out by Parker and Skitmore [20] which yielded 97% of the respondents strongly agreeing that project managers are critical to project success. The results emphasise the criticality and value of project management principles perceived by active industry professionals. Successful project management techniques will contribute to the achievement of projects, but project management will not stop a project from failing to succeed [19].

The project manager's role in project failure is not as important as the project manager's role in project success. Although the results indicate the significance of a project manager's role in project failure as important, the scale of importance in comparison to project success is not as extreme. Munns and Bjeirmi [19] affirm that the right project will almost succeed without the success of project management; however, successful project management could enhance the success of a project.

#### 4.2.6. Reducing the Effects of RPM

The following control strategies to facilitate handover during RPM were presented:

- Document control,
- Including a senior project leader in all communications (including meetings and emails),
- Project management office (PMO), and
- Other (respondent to specify).

The results of the survey identified "Including a senior project leader in all communications" to be the most effective method to facilitate a handover (71%, n=32). "Document control" received a 67% (n=30) response, "PMO" 38% (n=17) and "other" 18% (n=8). "Other" was identified to be a sufficient handover period between the replacement project manager and the replaced project manager.

Figure 29 graphically presents the cumulative percentage distribution for the controls to facilitate RPM to reduce impact on a project.

### Controls to Facilitate Handover

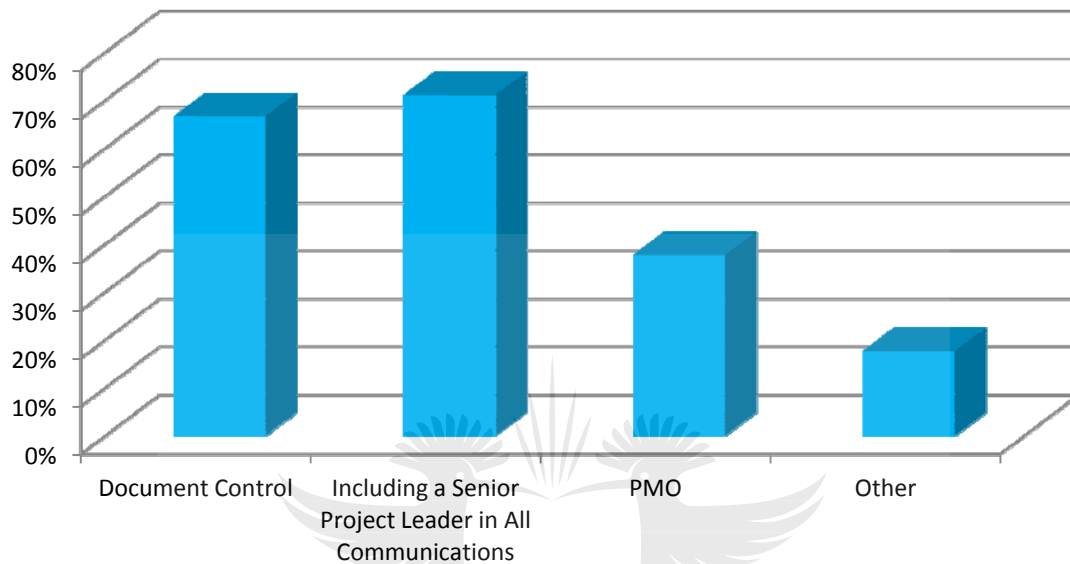


Figure 29: Cumulative percentage distribution of responses to facilitate RPM to reduce impact on a project

The results of the controls to facilitate handover are tabulated in Table 7 and ranked according to effectiveness.

Table 7: Summary of controls to facilitate handover during RPM

CONTROL PLAN	NO. OF RESPONSES TO CONTROL PLAN	% OF RESPONSES TO CONTROL PLAN	RANKING OF CONTROL PLAN
Including a Senior Project Leader in All Communications	32	71%	1
Document Control	30	67%	2
Project Management Office	17	38%	3
Other	8	18%	4

“Including a senior project leader in all communications” is ranked as the most effective control to facilitate a handover process. The control can be implemented in the early stages of a project by clearly defining the project communications plan. To have the communications plan agreed and signed-off by major stakeholders ensures that information is transmitted via the correct channels and distributed to influential project personnel.

“Document control” is ranked as the second most effective control to facilitate handover. The effectiveness of this control is dependent on an organisation’s document control system. Emails and communications are not always captured by document control and therefore loss of information is inevitable.

“Project management office” as a control plan to facilitate handover was not identified as being as effective as the alternative control plans put forward. A response rate of 38% (n=17), indicates that the benefit of implementing a PMO is still on the increase but not yet fully recognised as an important project tool, not only to facilitate a handover, but to ease project processes. Project management maturity in organisations and the correct implementation of the PMO to move from individual dependency into process-driven techniques appear weak.

“Other” identified as implementing a sufficient handover period between the replacement project manager and the replaced project manager, was not an option put forward. However, 18% (n=8) of respondents indicated that a handover period is critical to RPM.

### 4.3. Considerations

The conducted survey identifies that replacement of the project manager during project execution is a common phenomenon. Literature also suggests that RPM is most frequently experienced during the execution phase. Furthermore, in terms of the motives for departing a project as a successful project manager and the requirement for personal growth, the survey results indicate a tendency of RPM to have a net negative effect on a project. A net positive effect is only experienced under irregular circumstances that could be predicted and corrected in the early stages of the project.

RPM and the negative effect it could potentially have on a project as a result of the project manager departing a project on their own accord is the true concern. The controls to facilitate the handover were discussed and found to be effective measures to control and facilitate RPM should it transpire. Project management maturity and the ineffective implementation of the PMO as a tool to move forward from individual dependency into project management processes by means of organisation policies and procedures should be considered to be a vital step towards reducing the effects of RPM. The survey documents RPM in detail – the frequency of occurrence, the effects on the identified project management areas and the project manager’s critical role in project success and failure. However, all the discussion points identified were focused on RPM; the “now” and not the “what if”. Organisations should want to

mitigate and control RPM before it transpires and impacts interdependent project management areas and project outcomes.

With the movement into projectised organisations and the roles and responsibilities of the project manager, organisations should identify RPM as a threat to current and future projects. The requirement for selecting the appropriate project manager in the early stages is critical to a project. However, the selected project manager will need motivation to see the project through from conception to phase out. Organisations should consider incentives to motivate the project manager, including personal skills development and/or monetary value, for total dedication to a project. A study conducted by Hancock [32] suggests that cash rewards are the highest ranked forms of recognition – pay matters because it carries both economic and symbolic meanings. It represents the going market price for knowledge workers expertise in the external labour market and it indicates how much they are worth in the eyes of management [32].

#### 4.4. Survey Limitations

The sample size used to conduct the analysis of investigating the effects of replacing the project manager during project execution was sufficient to determine valuable results but inadequate to apply actual statistical techniques. A larger sample size with a better response rate will provide more accurate results. The low response rate can be attributed to an individual's lack of interest in the survey, as well as private email addresses listed on the professional social network that may not be accessed as often as work email addresses.

The targeted industries were widespread and although the greater portion of respondents were from an EPC or EPCM type environment, a survey dedicated to these industries with similar target markets would be advantageous for refining categorised results.

The literature emphasises the importance of organisational structures and the most commonly adopted organisation structure type in an EPC or EPCM organisation. The survey provided valuable results to ascertain outcomes of RPM, however, it would be of interest to further determine the impact of RPM and categorise the outcomes as a function of the organisation structure type implemented in EPC and EPCM industries.

#### 4.5. Chapter Four Conclusion

The chapter presents the survey findings for replacing the project manager during project execution. The following summary is deduced from the respondents' responses to the survey:

- 93% confirmed having experienced RPM in their work environment,
- 62% confirmed that RPM has a net negative effect on a project,
- 31% confirmed that RPM has a net positive effect on a project,
- 48% confirmed that career motives are the main drive for a project manager departing a project, and
- 71% confirmed that including a senior project leader in all communications is the best control to facilitate a project handover.

The impact on a project as a result of RPM is summarised in Table 8. The identified project management key areas are ranked from the most affected to the least for both cases of RPM – net negative and net positive affected projects.

Table 8: Summary of project management key areas impacted by RPM

REPLACING THE PROJECT MANAGER DURING PROJECT EXECUTION			
NEGATIVELY AFFECTED PROJECTS		POSITIVELY AFFECTED PROJECTS	
RANKING	IMPACTED PROJECT MANAGEMENT KEY AREA	RANKING	IMPACTED PROJECT MANAGEMENT KEY AREA
1	Communication	1	Client's Trust
2	Project Schedule and Performance	2	Project Schedule and Performance
3	Documentation and Information Sharing	3	Communication
4	Client's Trust	4	Team Motivation
6	Project Risk	6	Documentation and Information Sharing
5	Team Motivation	5	Project Risk
7	Cost and Cash Flow	7	Cost and Cash Flow
8	Other	8	Other

## Chapter Five: Conclusion and Recommendations

### 5.1. Conclusion

Replacing the project manager (RPM), a form of managerial turnover, will almost always have an effect on a project outcome. The topic, "Investigating the effects of replacing the project manager during project execution," was identified to be a critical subject with little information addressing the issue.

A literature review was prepared to identify project management, the project management techniques, the value of project management, and the growth of project management in all industries. Organisational structures and the influence of organisational structures on projects supported the identification of the project manager's critical role in the management of a project.

The literature review also identified the competency of a project manager, and the roles and responsibilities of a project manager in terms of critical project success factors. The project manager and association with project success and project management success from an overall perspective was shown to differ significantly. However, a biased approach from an EPC or EPCM organisation indicates that completing a project on schedule and within budget are generally benchmarks for project success.

Finally, the literature review identifies the fact that the maximum effort is required during the execution phase of a project, verifying the vulnerability of a project during this stage, should RPM take place. Documented surveys carried out by others confirm that RPM is a high risk issue, primarily occurring in the execution phase of the project life cycle, increasing risk, cost and the probability of project failure [20].

Two research methodologies were identified for the dissertation research approach:

1. A qualitative research method in the form of a case study.
2. A quantitative research method in the form of a web-based survey.



The case study identified that the net effect on a project during RPM is negative with emphasis on the identified key areas of project management. The case study provided a preliminary investigation based on the author's experience and a quantitative research approach followed to permit further investigation to conclude the effects of RPM.

The web-based survey was developed to investigate the occurrence of RPM in EPC and EPCM type organisations. The results yielded 93% of respondents experiencing RPM in the work place – an extremely high frequency of project management turnover in the execution phase of a project. The net effect on a project as a result of RPM was identified and two classes disclosed:

1. The project manager had to be replaced in order to rescue a troubled project and resulted in a net positive effect.
2. The project manager resigned and was replaced reluctantly by the organisation and resulted in a net negative effect.

The results yielded 31% of respondents identifying RPM with a net positive effect compared to 62% of respondents identifying RPM with a net negative effect – a major stake in the results. The high percentage identified with the second class has an impact on communication (85%), project schedule and performance (73%), documentation and information sharing (69%), client's trust (65%), project risk (54%), and cost and cash flow (27%), in sequence from the highest ranked negatively impacted areas of project management.

A net positive effect is only experienced under irregular circumstances that could be predicted and corrected in the early stages of the project. RPM and the negative effect it could potentially have on a project as a result of the project manager departing a project on their own accord is the true concern. With the movement into projectised organisations and the roles and responsibilities of the project manager, organisations should identify RPM as a threat to current and future projects.

The controls to minimise the impact of RPM and facilitate the handover between the replaced project manager and the replacement project manager were identified to include a senior project leader in all communications (71%), document control (67%), PMO (38%) and implementing a sufficient handover period (18%). A low response rate of 38% for PMO, indicates that the benefit of implementing a PMO is still on the increase but not yet fully recognised as an important project tool, not only to facilitate a handover, but to ease project processes. Project management maturity and the ineffective implementation of the PMO as a tool to move forward from individual dependency into project management processes by

means of organisation policies and procedures should be considered to be a vital step towards reducing the effects of RPM.

The requirement for selecting the appropriate project manager in the early stages of a project is critical to a project. However, the selected project manager requires motivation to see the project through from conception to conclusion. Organisations should consider incentives to motivate the project manager, including personal skills development and/or monetary value, in order to mitigate RPM and the effects it could potentially have on project success. Literature indicates that cash rewards are the highest ranked forms of recognition for knowledge workers such as project managers [32].

## 5.2. Recommendations for Future Work

The qualitative research approach in the dissertation focused on a single case study in which the project under examination had a net negative effect. It is recommended that similar case studies be investigated and compared to the outcomes of the case study. Further analysis of the cause-and-effect of RPM and the interdependent areas of project management affected downstream, and the project risk associated with RPM, particularly adapted to a customised Ishikawa or “fishbone” diagram illustrated in Figure 30 will be an interesting topic for investigation in the future.

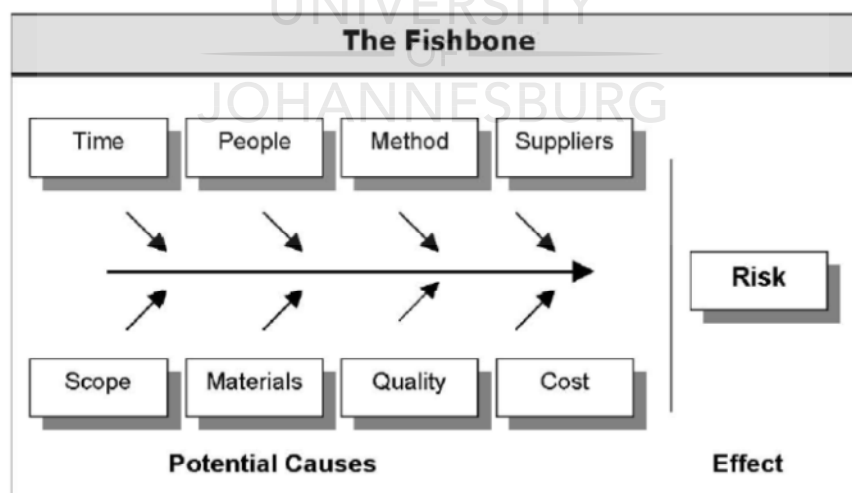


Figure 30: Example of a fishbone cause and effect diagram [33]

The survey presented interesting results on a high level of RPM. It would be of interest to further determine the impact of RPM and categorise the outcomes as a function of the organisation structure type implemented in EPC and EPCM industries. Quantitative research can be carried out to further investigate all circumstances of RPM to an elaborative level of analysis.



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**ANNEXURE A**  
**Survey Template**



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## THE EFFECTS OF REPLACING THE PROJECT MANAGER DURING PROJECT EXECUTION

Minor Dissertation Survey for the Requirements of MEng Engineering Management 2014

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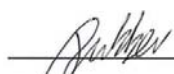
Your experience and interaction as/with a Project Manager will assist in collecting and interpreting data in a minor dissertation for the requirements of the degree - Master of Engineering Management.

Please add as much relevant detail to the questionnaire as the information provided will help facilitate the interpretation and validation of the literature for the abovementioned topic.

**All responses, including any personal information you provide, will be kept strictly confidential.**

Thank you for your time and your valued response.

Sincerely,

  
James Dubber

---

**1. In your experience, have you ever witnessed a colleague (or yourself) in the project management role resign or be transferred during the execution phase of a project life-cycle?**

- YES  
 NO



**2. If you answered "YES" to Question 1, please will you elaborate on the circumstances for the project manager departing the project.**

- Career motives and personal development (Including internal transfer)
- Job dissatisfaction
- Company structure and/or culture
- High stress environment
- Other, please specify below:

**3. In witnessing the replacement of the project manager (RPM) during the execution phase of the project, did you find that the impact on the project was:**

- Positive. The overall project performance, team-work and communication was improved through RPM.
- Negative. RPM caused a ripple effect that affected many project elements.
- Indifferent. No substantial impact.

Please add the degree to which you found RPM to impact the project::

	Very Negative	Negative	Neutral	Positive	Very Positive
Impact on project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**4. If you answered "Positive" to Question 3, please indicate below what the positive outcomes of RPM were. Please select multiple applicable fields.**

- Project schedule and performance improvements
- Cost and cash flow improvements
- Reduced project risk
- Communication improvements
- Documentation and information sharing improvements
- Client's trust and confidence in the new project manager/contracting company
- Increased project team motivation
- I don't know
- Other, please specify below:

Additional comments:

**5. If you answered "Negative" to Question 3, please indicate below what the negative outcomes of RPM were. Please select multiple applicable fields.**

- Deteriorated project schedule and performance
- Deteriorated cost and cash flow
- Increased project risk
- Deteriorated communication
- Documentation and information sharing (Including loss of information)
- Client's trust and confidence in the new project manager/contracting company
- Decrease in project team motivation, increase in conflict and confusion
- I don't know
- Other, please specify below:

Additional comments:

**6. In your experience, how important is the role of the project manager in project success?**

	No Effect	Not very Important	Neutral	Important	Very Important
Role of the PM in project success	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**7. In your experience, how important is the role of the project manager in project failure?**

	No Effect	Not very Important	Neutral	Important	Very Important
Role of the PM in project failure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**8. What controls would best be implemented to facilitate the hand-over during RPM?**

- Document control system
- Including a senior project leader in all communications (Including meetings and emails)
- Central project management office (PMO)
- Other, please specify below:

Additional comments:

PERSONAL INFORMATION FOR DEMOGRAPHIC PURPOSES

**9. What is your current position within your current company of employment?**

- Senior management (the project manager reports to you)
- Project manager (you report to senior management)
- Project team member (you report to the project manager)

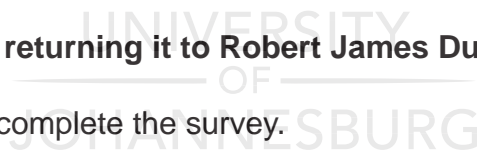
**10. What industry are you currently working in?**

**11. What is your level of experience within your field?**

**12. Please add your name and contact details in the box provided below (Your details will not be shared with any third party):**

**Please save the survey before returning it to Robert James Dubber (rjdubber@gmail.com)**

Thank you for taking the time to complete the survey.



## ANNEXURE B

### Data Collection



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Repondent No.	Question 1		Question 2					Question 3		
	Yes	No	Career Motives	Job Dissatisfaction	Company Structure/Culture	High Stress Environment	Other	Positive	Negative	Indifferent
1	1					1			1	
2	1						1		1	
3		1								
4	1		1							1
5		1								
6	1		1						1	
7	1				1					1
8	1		1					1		
9	1						1	1		
10	1				1				1	
11	1		1						1	
12	1						1	1		
13	1						1		1	
14	1		1						1	
15	1				1				1	
16	1						1	1		
17	1				1				1	
18	1		1						1	
19		1								
20	1			1					1	
21	1						1		1	
22	1		1						1	
23	1				1					1
24	1		1						1	
25	1				1			1		
26	1					1			1	
27	1				1			1		
28	1		1						1	
29	1						1		1	
30	1		1					1		
31	1		1					1		
32	1					1		1		
33	1		1					1		
34	1		1						1	
35	1						1	1		
36	1		1						1	
37	1						1	1		
38	1						1		1	
39	1		1						1	
40	1		1						1	
41	1		1						1	
42	1				1			1		
43	1		1						1	
44	1		1						1	
45	1		1						1	
45	42	3	20	1	8	3	10	13	26	3
100%	93%	7%	48%	2%	19%	7%	24%	31%	62%	7%

Repondent No.	Question 4								
	Negative	Project Schedule and Performance	Cost and Cash Flow	Project Risk	Communication	Documentation and Information	Clients Trust	Team Motivation	Other
1	1	1	1	1	1	1	1		
2	1	1				1			
3									
4									
5									
6	1	1		1		1	1		
7									
8									
9									
10	1	1			1	1	1	1	
11	1	1		1	1	1		1	
12									
13	1				1		1		
14	1	1	1		1		1		
15	1	1	1	1	1	1			
16									
17	1	1			1	1	1		
18	1				1			1	
19									
20	1	1	1	1	1	1	1		
21	1	1	1	1	1	1	1	1	
22	1				1			1	
23									
24	1				1	1		1	
25									
26	1				1	1	1		
27									
28	1	1	1	1	1	1	1	1	
29	1	1			1	1		1	
30									
31									
32									
33									
34	1	1		1		1	1	1	
35									
36	1	1		1	1		1		
37									
38	1				1	1		1	
39	1			1	1	1		1	
40	1	1					1	1	
41	1	1		1	1		1		
42									
43	1	1	1	1	1	1	1	1	
44	1	1		1	1		1		
45	1	1		1	1	1	1	1	
45	26	19	7	14	22	18	17	14	0
100%	100%	73%	27%	54%	85%	69%	65%	54%	0%

Repondent No.	Question 5									Question 6				
	Postive	Project Schedule and Performance	Cost and Cash Flow	Project Risk	Communication	Documentation and Information	Client's Trust	Team Motivation	Other	No Effect	Not Very Important	Neutral	Important	Very Important
1														1
2													1	
3														1
4														1
5														1
6														1
7													1	
8	1						1							1
9	1	1		1	1	1	1	1						1
10														1
11														1
12	1	1	1	1		1	1							1
13													1	
14														1
15														1
16	1	1		1	1	1	1	1					1	
17													1	
18														1
19														1
20														1
21														1
22														1
23													1	
24														1
25	1	1		1	1		1							1
26														1
27	1	1					1						1	
28														1
29													1	
30	1	1			1	1	1	1						1
31	1				1		1	1						1
32	1	1			1	1	1	1						1
33	1	1			1	1	1	1					1	
34														1
35	1						1						1	
36														1
37	1	1			1		1	1						1
38														1
39														1
40														1
41														1
42	1						1	1						1
43														1
44														1
45														1
45	13	9	1	4	8	6	12	8	0	0	0	0	10	35
100%	100%	69%	8%	31%	62%	46%	92%	62%	0%	0%	0%	0%	22%	78%

Repondent No.	Question 7					Question 8				Question 9		
	No Effect	Not Very Important	Neutral	Important	Very Important	Document Control	Including a Senior Project Leader in All Communications	PMO	Other	Senior Management	Project Manager	Project Team Member
1					1	1	1				1	
2				1		1			1		1	
3					1		1			1		
4					1			1			1	
5					1		1					1
6					1		1		1	1		
7					1	1	1					1
8				1			1		1			1
9					1	1	1	1			1	
10					1	1	1	1		1		
11					1	1					1	
12				1			1	1			1	
13				1			1					1
14				1		1		1		1		
15					1	1	1	1			1	
16					1	1	1		1			1
17				1		1				1		
18				1			1		1			1
19					1	1	1					1
20					1	1		1		1		
21				1		1	1	1			1	
22					1	1	1				1	
23				1			1				1	
24					1				1		1	
25					1	1	1	1				1
26				1		1	1					1
27			1			1	1					1
28					1	1	1	1				1
29					1	1	1					1
30					1	1	1					1
31					1			1			1	
32				1		1	1				1	
33				1				1				1
34					1	1	1				1	
35				1			1	1				1
36				1		1	1			1		
37					1	1						1
38					1				1			1
39					1	1	1				1	
40				1		1	1			1		
41			1			1	1	1		1		
42				1		1	1				1	
43					1	1	1	1		1		
44				1		1	1	1		1		
45				1		1	1	1	1			1
45	0	0	2	18	25	30	32	17	8	10	16	19
100%	0%	0%	4%	40%	56%	67%	71%	38%	18%	22%	36%	42%



Repondent No.	Question 10					Question 11			
	Construction	Mining	Product Design and Development	Machinery and Specialised Equipment	Other	<5 years	5-10 years	10-20 years	20+ years
1					1			1	
2		1					1		
3		1							1
4				1			1		
5					1		1		
6		1							1
7		1					1		
8	1						1		
9					1				1
10		1							1
11			1			1			
12					1				1
13		1						1	
14		1					1		
15				1				1	
16			1				1		
17			1				1		
18		1						1	
19		1					1		
20					1				1
21					1			1	
22		1					1		
23				1					1
24		1						1	
25		1				1			
26	1						1		
27	1					1			
28				1		1			
29					1				1
30	1						1		
31		1						1	
32		1					1		
33		1							1
34					1			1	
35					1			1	
36		1						1	
37		1						1	
38		1						1	
39		1					1		
40		1							1
41		1							1
42		1						1	
43					1	1			
44		1							1
45	4	24	3	4	10	6	14	13	12
100%	9%	53%	7%	9%	22%	13%	31%	29%	27%

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